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The Microchaetidae of Natal, with descriptions of new species of *Microchaetus* Rapp and *Tritogenia* Kinberg, and the new genus *Proandricus* (Oligochaeta)

by

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ABSTRACT

The genus *Microchaetus* Rapp, 1849 is reviewed. Holandric species (*benhami*, *braunsi*, *caementerii*, *crousi*, *decipiens*, *franciscus*, *guntheri*, *klopperi*, *ljungströmi*, *microchaetus*, *namaensis*, *natalensis*, *papillatus*, *parvus*, *pearsonianus*, *pentheri*, *peringueyi*, *pondoanus*, *rosai*, *stuckenbergi*) are left in *Microchaetus*, while *Proandricus* is erected for species with the proandric condition (*beddardi*, *belli*, *brincki*, *colletti*, *gracilis*, *humicultor*, *lesothoensis*, *marenzelleri*, *marleyi*, *modestus*, *timmianus*, *warreni* – all transferred from *Microchaetus*).

Previously known species of *Tritogenia* Kinberg, 1867 from Natal are listed (*benhami*, *crassa*, *curta*, *grisea*, *howickiana*, *karkloofia*, *morosa*, *mucosa*, *shawi*, *sulcata*). *Microchaetus zululensis* Beddard, 1907 is transferred to *Tritogenia*; new data are provided for *melmothana* (Michaelsen, 1928), confirming placement in *Tritogenia*; the new species *ngomensis* is described.

New species: *Microchaetus* – *mkuzi*, *vernoni*, *zaloumisi*; *Proandricus* – *babanango*, *bulwerensis*, *entumeni*, *jasoni*, *thornvillensis*.

New synonym: *Microchaetus ivari* Michaelsen, 1907 = *Proandricus gracilis* (Michaelsen, 1907).

Keys to all South African species, for all three genera, are provided.

INTRODUCTION

This paper was inspired by the acquisition of new microchaetid material collected from Natal in which nine new species were found.

The aim of this paper was to study all Natal species previously assigned to *Microchaetus*. The nephridia, as well as the holandric and proandric conditions of testes, were considered. This has given new insights into the relationships of the species; *Microchaetus s. l.* is divided into two genera: *Microchaetus s. str.* and *Proandricus* gen. n. Holandric species (ie. these with two pairs of testes and two pairs of spermiductal funnels, sited in segments 10 and 11), are left in *Microchaetus*; proandric species (with only one pair of testes and one pair of spermiductal funnels in segment 10) are placed in *Proandricus*.

Study of the nephridia has allowed *zululensis* and *melmothana* to be allocated to *Tritogenia*.

MATERIAL AND METHODS

This study centred on the Natal Museums collection of Microchaetidae. However, type and comparative material from other institutions was also used. Information provided under the heading material examined is derived entirely from specimen labels; latitudes and longitudes, given in brackets, immediately

follow the place names they refer to. Data not found on the original labels are given in square brackets. The drawings were made with the aid of a drawing-tube attached to a Wild stereo-microscope; photographs were taken using a Wild photo-microscope.

Abbreviations:

BMNH	–	The Natural History Museum, London, U. K.
JDP	–	J. D. Plisko.
LEUB	–	Department of Ecology and Systematic of the Loránd-Eötvös University, Budapest, Hungary.
NHMW	–	Naturhistorisches Museum, Vienna, Austria.
NHRS	–	Naturhistoriska Riksmuseet, Stockholm, Sweden.
NMSA	–	Natal Museum, Pietermaritzburg, South Africa.
NMSA/Olig.	–	Oligochaeta Collection of the Natal Museum.
USNM	–	United States National Museum Natural History, Washington, D.C. USA.
ZMUH	–	Zoologisches Institut, Universität Hamburg, Germany.

TAXONOMY

Key to the genera of South African Microchaetidae

1 One pair of meganephridia per segment. One oesophageal gizzard only in segment 7 2

– More than one pair of nephridia per segment. One gizzard in segments 6–7 or rarely in 7 ..... **Tritogenia** Kinberg, 1867

2 Testes and spermiductal funnels with holandric arrangement ..... **Microchaetus** Rapp, 1849

– Testes and spermiductal funnels with proandric arrangement ..... **Proandricus** gen. n.

Microchaetus Rapp, 1849

Type species: *Lumbricus microchaetus* Rapp, 1849 by monotypy.

Preclitellar segments with secondary, external annulation. Setae lumbricine, paired; *dd circa* 1/2 *u*. Nephropores in or near *cd* setal lines. Dorsal pores absent. Paired female pores on 14. Male pores in clitellar region. Clitellum saddle-shaped; tubercula pubertatis present; genital fields and papillae present or absent.

Some of preclitellar septa thickened. One oesophageal gizzard in 7. Calciferous glands in the region of 9–10; separated or medially fused, sometimes with only vestigial dorsal furrow. Dorsal blood vessel preclitellarly single or doubled. One pair of meganephridia per segment. Holandric; testis sacs present or absent. Genital glands present or absent. Prostate absent.

Terrestrial. Known only from South Africa; 23 species.

Key to the species of *Microchaetus* Rapp, 1849

1 Only two septa, 7/8 and 8/9, thickened 2
– More than two septa thickened 5

2 Spermathecal pores in one or two intersegmental furrows 3
– Spermathecal pores in more than two intersegmental furrow 4

3 Spermathecal pores in 12/13; clitellum on 12–19, 20; tubercula pubertatis on 16, 1/*n* 16–17, 18 ..... **pondoanus** Michaelsen, 1913
– Spermathecal pores in 11/12 and 12/13; clitellum on 12–24; tubercula pubertatis rimmed, on 16–20 ..... **caementerii** Michaelsen, 1913

4 Spermathecal pores in 12/13, 13/14, 14/15, 15/16 (or sometimes also in 16/17); clitellum on 10–30; tubercula pubertatis prominent, protruding laterally, on 16, 1/*n* 16–1/*n* 20, 20 ..... **papillatus** Benham, 1892
– Spermathecal pores in 12/13, 13/14, 14/15, 15/16, 16/17; clitellum on 10–32; longitudinal tubercula pubertatis on 18–22 ..... **stuckenbergi** Plisko, 1991

5 Three septa thickened 6
– More than three septa thickened 14

6 Septa 4/5, 7/8, 8/9 thickened 7
– Septa 4/5, 5/6, 6/7 thickened 9

7 Spermathecal pores in one intersegmental furrow 13/14; clitellum on ¼ 13–20; tubercula pubertatis on 16–18 ..... **zaloumisi** sp. n.
– Spermathecal pores in two intersegmental furrows 13/14 and 14/15 8

8 Clitellum on 13–22; tubercula pubertatis on 15–18 ..... **natalensis** (Kinberg, 1867)
– Clitellum on 12, 13–21; tubercula pubertatis on 15, 16–17, 18 ..... **parvus** Michaelsen, 1913

9 Spermathecae absent; clitellum on 10–26; tubercula pubertatis on 17–23 ..... **namaensis** Michaelsen, 1908
– Spermathecae present 10

10 Spermathecal pores in three intersegmental furrows: 13/14, 14/15, 15/16 .. 11
– Spermathecal pores in more than three intersegmental furrows 12

11 Clitellum on 11–1/2 28; tubercula pubertatis on 18–1/2 23 ..... **pearsonianus** Pickford, 1975
– Clitellum on 1/2 13–26; tubercula pubertatis on 17–20, 21 ..... **franciscus** Pickford, 1975
– Tubercula pubertatis on 18–28 ..... **guntheri** Pickford, 1975

12 Spermathecal pores in four intersegmental furrows 13
– Spermathecal pores in six intersegmental furrows: 10/11, 11/12, 13/13, 13/14, 14/15, 15/16; clitellum on 14–27, 28; tubercula pubertatis on 18–27 ..... **benhami** Rosa, 1891

13 Spermathecal pores in 12/13, 13/14, 14/15, 15/16; clitellum on 15–24; tubercula pubertatis on 17–20 ..... **rosai** Michaelsen, 1908
– Spermathecal pores in 13/14, 14/15, 15/16, 16/17; clitellum on 14–23; tubercula pubertatis on 16–21 ..... **crousi** Pickford, 1975

14 Four septa: 4/5, 5/6, 7/8, 8/9 thickened 15
– Five or six septa thickened 20

15 Spermathecal pores in 12/13 and 13/14; clitellum on 12–22; tubercula pubertatis on 17–19, 20 ..... **pentheri** Rosa, 1898
– Spermathecal pores in more than two intersegmental furrows 16

16 Spermathecal pores in three intersegmental furrows: 12/13, 13/14, 14/15 17
– Spermathecal pores in four or five intersegmental furrows 18

17 Clitellum on (9), 10, 11–(23), 24; tubercula pubertatis on 20–24 ..... **decipiens** Michaelsen, 1899
– Clitellum on 12–31, 1/*n* 32; tubercula pubertatis on 16–19, 1/*n* 20 ..... **vernoni** sp. n.

18 Spermathecal pores in four intersegmental furrows: 12/13, 13/14, 14/15, 15/16; clitellum on 13–25, 26; tubercula pubertatis on 18–25 ..... **microchaetus** Rapp, 1849
– Spermathecal pores in five intersegmental furrows: 12/13, 13/14, 14/15, 15/16, 16/17 19

19 Clitellum on 10, 11–31 (32, 33, 34); tubercula pubertatis on 18, 19–24 ..... **braunsi** Michaelsen, 1899
– Clitellum on 11–32; tubercula pubertatis on 22–29 **klopperi** Plisko, 1991

20 Five septa: 4/5, 5/6, 6/7, 7/8, 8/9 thickened 21
– Six septa: 4/5, 5/6, 6/7, 7/8, 8/9, 9/10 thickened; tubercula pubertatis on 1/2 15–19 ..... **ljungströmi** Pickford, 1975

21 Spermathecal pores in five intersegmental furrows: 12/13, 13/14, 14/15, 15/16, 16/17; clitellum on 12, 13–25; tubercula pubertatis on 17–22 ..... **peringueyi** Michaelsen, 1913
– Spermathecal pores in six intersegmental furrows: 10/11, 12/12, 12/13, 13/14, 14/15, 15/16; clitellum on 11, 12–27, 28; tubercula pubertatis on 19–27 ..... **mkuzi** sp. n.

Microchaetus caementerii Michaelsen, 1913

Microchaetus papillatus Benham, 1892 var. *caementerii* Michaelsen, 1913*c*: 429; Reynolds & Cook, 1976: 83. Holotype ZMHU; paratype NMSA.
Microchaetus caementerii Michaelsen, 1918: 321; Pickford, 1975: 23; Plisko, 1991*a*: 282.
Microchaetus caementerii cf. *M. papillatus* var. *caementerii*; Reynolds & Cook, 1976: 83.

The original description of the species was based on material collected from Pietermaritzburg [29°36′S:30°24′E] and near Howick [29°27′S:30°14′E], while the redescription (Plisko 1991*a*) was based on a paratype and material collected from the type locality and surrounding area. Presently examined material possesses the characters previously described, though a small degree of individual variation in the shape of the tubercula pubertatis and papillae exists: the rim around tuberculum sometimes diminishing medially; size, number and position of papillae differ in some specimens. These variations are possibly related to the degree of maturity of the specimens.

Material examined: Natal: Karkloof Falls Nature Reserve, Safari World

(29°25'S:30°18'E), primary grassland, 28 January 1991, 3 abscised anterior parts of mature specimens, NMSA/Olig.00714. Otto's Bluff (29°30'S:30°23'E) the Crag Farm, pasture, 28 January 1991, 3 clitellate and 1 juvenile, NMSA/Olig.00709. Both samples collected by JDP.

Known only from Natal.

Microchaetus mkuzi sp. n.

Figs 1–3. Table 1

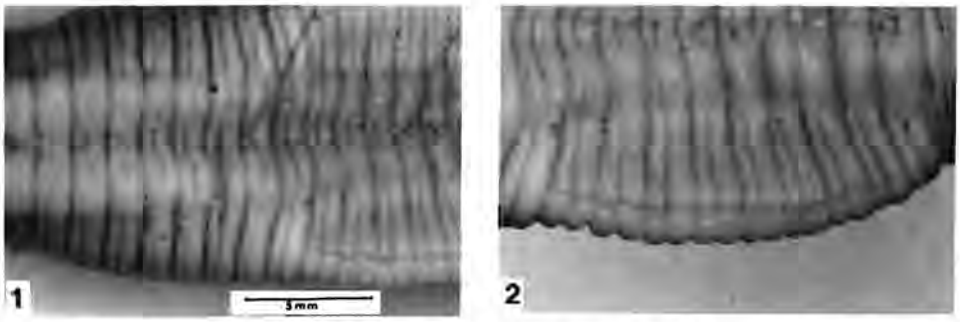
Etymology: Named after the Mkuzi Game Reserve.

Material examined: Natal: Mkuzi Game Reserve (27°36'S:32°15'E), swamp in riverine bush on the bank of Mkuze River, muddy sandy soil, 22 February 1990, 1 clitellate holotype, 8 complete mature and 21 abscised anterior parts of mature paratype specimens, 7 juveniles and 16 abscised posterior parts, JDP & J. Turner leg. Holotype NMSA/Olig.00630, paratypes: NMSA/Olig.00631–00632, abscised parts NMSA/Olig.00633.

External characters

General: In life plump, soft; alcohol preserved medium soft; body cylindrical, peaked at first segment. *Colour*: In life flesh-pink with grey tint; preserved light-grey. *Dimensions*: mature specimens 110–213 mm + (the longest specimen was abscised during collection). *Segments number*: 169–193. *Prostomium*: rudimentary, prolobous, not distinguished from first segment. *Segmentation*: 1–2 simple with longitudinal, irregular grooves, both segments much smaller than the following; 3 simple, with transverse, incomplete circular annulation; 4–9 with 2 ringlets divided by 2 or three annuli; 10 and clitellar segments ventrally and dorsally with many deep, irregular, transverse grooves. *Setae*: Minute, but clearly visible, closely paired; first pairs on 2, then on first ringlet of all subdivided segments; at preclitellar segments on small papillae. *Nephridial pores*: Very difficult to trace, in intersegmental lines somewhat above *cd* setal lines. *Female pores*: Large, conspicuous; a pair on 14, midway between *bc* setal lines. *Male pores*: Not detected externally. Probably in the area of 20, where vasa deferentia enter body wall. *Spermathecal pores*: Six pairs, lenticular, below *cd* setal lines in intersegmental furrows 10/11–15/16. In some paratypes abnormalities in spermathecal position were noted: at the right side in 9/10–14/15, one segment earlier than normal position.

Clitellar region (Fig. 1): *Clitellum*: Yellowish-white; saddle-shaped, demarcated by intersegmental furrows and deep, irregular transverse grooves; dorsally on 11, 12–27, 28; laterally on 11–18 extends up to the row of papillae, on 19–27 at midway between *b* and *c* setal lines abruptly terminated by deep longitudinal grooves. *Tubercula pubertatis* (Fig. 2): On 19–27; longitudinal, wrinkled bands, between clitellar lateral line and the edges of papillae; clearly rimmed dorsally and separated from clitellum by deep grooves. *Papillae*: In *ab* setal lines; oblong, smooth swellings, with short, transverse grooves and nipple-shaped, small glands; on 10–27, 28: 10–11 large, oblong, 12–18 somewhat smaller but similar in appearance, 19–27, 28 gradually diminishing in size.



Figs 1–2. *Microchaetus mkuzi* sp. n. 1. Clitellar region, ventrally. 2. Tuberculum pubertatis.

Internal characters

Septa: 4/5 slightly thickened, elastic, strong; 5/6 and 6/7 very much thickened, muscular; 7/8 and 8/9 moderately thickened, thicker than 4/5; other septa thin. *Gizzard*: In 7; large, muscular, oblong. *Calciferous glands*: In 9–10; dorso-laterally closely adherent to oesophagus; ventrally broadly separated; lamellar. *Intestine*: Commences in 13. *Dorsal blood vessel*: In 3–9 doubled, joined at septa; 3–5 close, not separated, thin tubes; 6–7 doubled, divided; in 8 two enlarged separated tubes; in 9 cordiform organ, built up from two enlarged tubes, partly separated; in 10 and the following segments a single, somewhat enlarged tube. *Paired dorso-ventral commissural vessels*: In 4–7 thin tubes; 8–11 enlarged, moniliform. *Supra-oesophageal vessel*: Commences in 15 and extends up to segment 5, forming laterally one main branch with many small vessels. *Nephridia*: Meganephridia; one pair per segment.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement; two pairs, free; in 10 and 11. *Vasa deferentia*: Two parallel tubes at each side, very close one to another, united before entering body wall in 20. *Seminal vesicles*: Two pairs of medium-sized sacs; in 10 and 11.

Spermathecae: One pair per segment, near to intersegmental furrows of 10/11–15/16; globular or oblong, coiled or simple. In some paratypes embedded deeply in body tissue. *Ovaria*: In 13, rosette-shaped, large, obvious. *Genital glands*: Minute, globular ampullae, associated with papillae, in 10–28. In some paratypes glands were not detected.

Biological notes: Material is from one locality only: riverine bushy swamp with green vegetation, at sea level, near the mouth of the Mkuze River. The swamp surface was dry, but the soil was moist at a depth of 20–40 cm. Sandy soil was interspersed with layers of organic matter deposited at different levels. The earthworms were found in all layers, some in close approximation with organic matter, some in sandy, moist soil. No casts were noticed on the soil surface. Excrements were found deposited in the soil in the form of small clod-like lumps (Fig. 3). A comparative study of casts and surrounding soil, conducted in the Soil Science Laboratory, Cedara Agricultural College, shows that casts are rich in nitrogen, calcium, magnesium, potassium, phosphorus and zinc (Table 1).

TABLE 1

Analytical results of soil and cast samples of *Microchaetus mkuzi* sp. n.

Sample descript.	Density g/ml	P	K	Ca mg/L	Mg	Zn	Acidity (Al+H) cmolc/L	Total cation	Acid satur. %	pH [KCl]
Soil	1,14	1	57	1126	353	0,4	0,01	8,68	0,1	7,11
Soil	1,19	1	70	997	377	0,4	0,03	8,29	0,4	7,13
Soil	1,18	2	63	1127	325	0,4	0,06	8,52	0,7	6,99
Average:	1,17	1,3	63,3	1083	351,6	0,4	0,03	8,50	0,4	7,08
Cast	0,96	3	89	1639	543	0,5	0,05	12,93	0,4	7,18
Cast	0,91	3	94	1687	558	0,9	0,01	13,26	0,1	7,21
Cast	0,96	3	83	1686	546	0,6	0,01	13,13	0,1	7,30
Average:	0,94	3	88,7	1670	549	0,6	0,02	13,11	0,2	7,20

The collection of a number of fully clitellate, mature specimens at the end of February, indicates that the species may be sexually active during summer.

Discussion: *M. mkuzi* is related to *M. benhami* Rosa, 1891. The general appearance, position of clitellum, papillae in clitellar region are similar in both species. Both are holandric with free spermiductal funnels, though data given by Rosa (1891) suggest the existence of testis sacs. Pickford (1975), however, did not confirm this. Six pairs of spermathecae usually between septa 10/11–15/16 were found in both species.

Nevertheless, differences between *benhami* and *mkuzi* are obvious. Septum 4/5 in *mkuzi* is clearly much thinner than the two following, thickened septa 5/6 and 6/7; 7/8 and 8/9 moderately thickened though much thinner than former septa. In descriptions of *benhami* only septa 4/5–6/7 have been noted as thickened, and Michaelsen (1913*a*) describes them as equally thick. Intestine commences in 13 (not in 14, as given for *benhami*). In *mkuzi* dorsal blood vessel is doubled in 3–9, separated in 6–9 while in *benhami* it is single. Supra-oesophageal vessel is present in *mkuzi*, absent in *benhami*. Spermiductal funnels are free in *mkuzi*, a fact conflicting with Rosas description of *benhami*, but in accordance with Pickford (1975).

TABLE 2

Analytical results of soil and cast samples of *Microchaetus vernoni* sp. n.

Sample descript.	Density g/ml	P	K	Ca mg/L	Mg	Zn	Acidity (Al+H) cmolc/L	Total cation	Acid satur. %	pH [KCl]
Soil	0,99	9	111	413	170	0,5	1,14	4,88	23,3	4,13
Soil	0,97	9	106	415	164	1,0	1,15	4,28	23,8	4,13
Soil	0,94	6	102	415	170	0,2	1,19	4,92	24,2	4,10
Average:	0,97	8	106,3	414	168	0,57	1,16	4,69	23,7	4,12
Cast	0,87	15	250	967	334	3,3	0,04	8,25	0,5	4,97
Cast	0,94	16	264	1058	328	3,7	0,08	8,73	0,9	5,00
Cast	0,97	16	254	1028	354	5,0	0,07	8,76	0,8	4,86
Average:	0,92	15,6	256	1017	338	4,0	0,06	8,57	0,7	4,94

Fig. 3. Casts deposited into the channels, dug out on the surface.

In *mkuzi* setae of preclitellar segments are on tiny but conspicuous papillae. It is impossible to miss this obvious character when studying specimens; Rosa (1891), Michaelsen (1900 1913*a* 1913*b*) and Pickford (1975) did not notice any of these papillae in *benhami*. The first pair of setae is clearly noticeable on segment 2, not on 5 or 6 as noted for *benhami*.

Tubercula pubertatis are consistently on 19–27, eg. one or two segments behind the condition found in *benhami*.

Comparative material of *benhami* identified by Pickford, deposited in USNM, kindly loaned to me by Mr C. F. Bright, is as follows: SOUTH AFRICA, [CAPE PROVINCE]: Cape Peninsula, Bergvleit Estate, Constantia Nek [34°02'S:18°26], 3 January 1926, G. E. Pickford coll./donor, 1 complete clitellate specimen, 2 clitellate, dissected specimens (re-examined by Pickford in 1974), and 12 semimature or mature specimens (USNM.52831). This appears to be the same locality as for material used by Michaelsen in his work on this species (1913*a* 1913*b* 1918). Bloem Erf [farm], Banhoek [= Banghoek, 33°55'S:18°55'E], 20 December 1925, G. E. Pickford coll./donor: in rich muddy soil, roots of reeds, by stream at foot of garden, 4 juveniles (USNM.52824); in carrot patch near stream, 3 juvenile specimens autotomised into six parts (USNM.52823); aestivating in dry stream bed, 1 semimature, dissected specimen (USNM.52821). Paarl District, Mill Stream Kloof, Paarl [33°48'S:18°58'E], 3 September 1926, Ethel Dix coll./donor G.E. Pickford, 3 semimature dissected, and 1 juvenile specimen (USNM.52830).

Microchaetus natalensis (Kinberg, 1867)

Geogenia natalensis Kinberg, 1867: 100; Perrier, 1886: 876; Beddard, 1895: 636; Michaelsen, 1899*b*: 428; Reynolds & Cook, 1976: 143. Type NHRS (not seen).
Geogenia [*Microchaeta*] *natalensis*; Michaelsen, 1899*b*: 428.
Geogenia [*Microchaetus*] *natalensis*; Michaelsen, 1900: 462.
Microchaetus natalensis; Michaelsen, 1913*c*: 422; 1918: 324; Pickford, 1975: 23; Reynolds & Cook, 1976: 143; Plisko, 1991*a*: 287.

The inadequate original description left the systematic position of this species in doubt for many decades. Michaelsen (1899*b* 1913*c*) studied the type and new material, giving a comprehensive redescription, to which I recently added further data (Plisko 1991*a*). External and anatomical characters of newly listed material agree with Michaelsen (1899*b* 1913*c*) and my recent description (Plisko 1991*a*).

New material examined: Natal: Umfolozi Game Reserve (28°20′S:31°50′E) from vegetable garden, 24 February 1990, 2 clitellate and 1 juvenile, NMSA/Olig.00634; Otto's Bluff (29°30′S:30°23′E) the Crag Farm, from pasture, 28 January 1991, 3 clitellate specimens, NMSA/Olig.00708; Pietermaritzburg (29°36′S:30°24′E): Scottsville, on the bank of Umsindusi River, from the first 15 cm layer of sandy soil and litter, 8 January 1989, 2 mature and 3 abscised parts, NMSA/Olig.00707; Bisley, on the bank of local stream, from muddy soil, 9 February 1989, 1 semimature, NMSA/Olig.00328; all material collected by JDP.

Known only from Natal. Recorded from many localities, from natural and cultivated biotopes.

Microchaetus papillatus Benham, 1892

Figs 4–6

Microchaeta papillata Benham, 1892: 141; Beddard, 1895: 672. Holotype BMNH.
Microchaeta papillata Benham, nunc. *Microchaetus papillatus*; Reynolds & Cook, 1976: 150.
Microchaetus papillatus; Michaelsen, 1900: 450; 1907: 5; 1918: 320; Pickford, 1975: 23.
Microchaetus papillatus f. *typicus* Michaelsen, 1913*c*: 426.
Microchaetus papillatus cf. *Microchaeta papillata*; Reynolds & Cook, 1976: 150.

Described on a single specimen collected from Port Natal [= Durban: 29°53′S:31°00′E] and redescribed by Michaelsen (1913*c*) on ten specimens collected from Durban and Pietermaritzburg [29°36′S:30°24′E]. Some of this material, deposited in NMSA, bears labels in Michaelsen's handwriting. One specimen (NMSA/Olig.00258), however, was not included in his paper. This specimen, measuring 800 mm long, 22 mm wide at segment 10, and 36 mm at tubercula pubertatis, with additional imperfect segments, demonstrates a variable position for the tubercula pubertatis on left and right sides. Probably, the larger dimension and abnormality in position of tubercula pubertatis, possibly due to regeneration of the segments, confused Michaelsen, leading him to comment on the label '... fore-end with abnormalities ... imperfect segments interposed ...' This probably caused him to exclude the specimen in his publication. Regeneration and abnormalities such as imperfect segments are, however, observed in many specimens, supposedly due to frequent autotomisation characteristic of this species.

Material examined: Natal: Holotype, Port Natal [= Durban 29°53′S:31°00′E],

S.A., coll. H. A. Spencer, BMNH 1892.3.10:3. Pietermaritzburg [29°36'S: 30°24'E]: Scottsville: March 1962, 3 semimature and 3 juveniles, J. Pringle leg., NMSA/Olig. 00353; Alexander [Alexandra Rd.] 21 February 1914, 1 mature, Jim Makanya leg., NMSA/Olig.00357; 17 Oribi Rd., removed from swimming pool, 27 February 1988, 1 mature, D. Herbert leg., NMSA/Olig.00361; from gardens lawn, 4 May 1989, 2 clitellate, JDP leg., NMSA/Olig.00452; Golf Field: after heavy rain, between roots of grasses and in first layer of the soil, 4, 5 and 8 January 1989, 10 clitellate, 4 juveniles and 9 abscised parts, JDP leg., NMSA/Olig.00365, NMSA/Olig.00373, NMSA/Olig.00402, NMSA/Olig.00462, NMSA/Olig.00488; 10 November 1989, 1 clitellate, 2 juveniles, 4 abscised clitellate anterior parts, 7 abscised parts, JDP leg., NMSA/Olig.00470–471; 30 January 1991, 2 juveniles and 3 abscised parts, JDP leg., NMSA/Olig.00721; 43 Washington Rd., from fallow ground, 8 and 26 January 1989, 4 clitellate specimens and one cocoon at early stage of development, JDP leg., NMSA/Olig.00401 and NMSA/Olig.00386; Hayfields: 94 Adams Rd., collected on the lawn, 30 November 1989, 1 immature, JDP leg., NMSA/Olig.00396; Darvill area: extension of New England Rd., primary grassland, from first 1–20 cm of grey, ashy soil, 1 December 1989, 3 semimature, JDP leg., NMSA/Olig.00443; from moist soil of dried bed of local stream, 11 October 1990, 1 semimature specimen in aestivation, JDP leg., NMSA/Olig.00660; Cleland: on the lawn in garden, 28 and 29 November 1989, 5 clitellate specimens, C. Shaw leg., NMSA/Olig.00451, NMSA/Olig. 00453;15 Lynroy Avenue, after heavy rain found between grasses, 2 December 1989, 1 semimature specimen; 26 January 1990, 1 clitellate, both collected by C. Shaw, NMSA/Olig.00374, NMSA/Olig.00366; Bisley: 51 Gilbert Rd., collected from the lawn after rain, 21 January 1989, D. G. O'Leary leg., NMSA/Olig.00398. Ashburton (29°40'S:30°28'E): Sunset Rd., found on the lawn in Mrs A. Kunz garden, 9 November 1989, 1 immature, regenerating specimen, P. Kunz leg., NMSA/Olig.00474; from the same garden watered during winter, 19 September 1990, 1 specimen with no clitellum, JDP leg., NMSA/Olig.00319; Springfield Rd., primary grassland, from first layer of wet soil, 3 February 1989, 3 clitellate specimens, JDP leg., NMSA/Olig.00455; from Dr T. Farkas garden, found on the surface, 19 September 1990, 1 specimen with no clitellum, JDP leg., NMSA/Olig,00318. Foxhill [29°31'S:30°35'E] near Pietermaritzburg, October 1932, 1 semimature, abscised specimen, W. Culingworth leg., NMSA/Olig.00354. Camperdown [29°45'S:30°34'E], 15 January 1933, 3 cocoons containing partially developed specimens, and one cocoon dissected (by myself) with 5 specimens removed from it, Mrs Willson Hiercer leg., NMSA/Olig.00355 and 355a. Durban [29°53'S:31°00'E]: 17 September 1927, 1 clitellate, H. W. Bell-Marley leg., NMSA/Olig.00352; Berea, 12 October 1927, 1 clitellate, H. W. Bell-Marley leg., NMSA/Olig.00350.

Restricted to the Durban/Pietermaritzburg area.

External characters

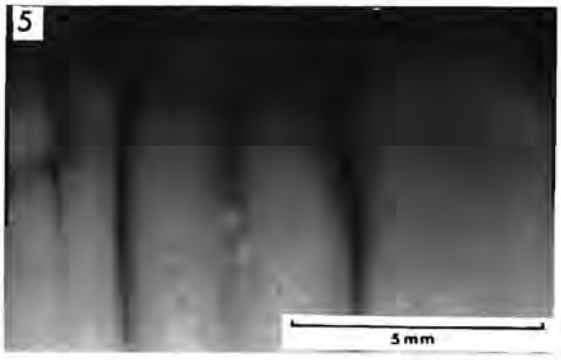
General: Body cylindrical, in life firm and muscular. Anterior part in preserved specimens with much contracted segments, very hard; postclitellarly softened;

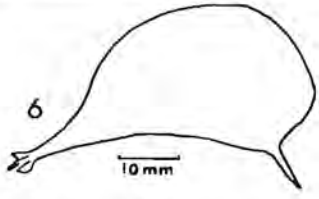
flattened at tubercula pubertatis. *Colour*: In life dorsally brown-grey with greenish tint; ventrally light grey. Preserved specimens dorsally dark grey, ventrally yellowish-grey. After long preservation orange-yellow. *Dimensions*: In life mature 400–800 mm long; preclitellarly 10 mm wide; preserved and contracted 300–670 mm long, 7–16 mm wide at 10, 12–29 mm at tubercula pubertatis. Juveniles removed from preserved cocoon 50–52 mm long, 5 mm wide. *Segments number*: Clitellate specimens 514–574; juveniles from cocoon 442–450. *Prostomium*: Prolobous with 6–9 longitudinal grooves. *Segmentation*: Mature or large juveniles: 1–2 simple with irregular, longitudinal grooves; 3 ventrally simple, dorsally partly with longitudinal grooves; 4–8 with 2 ringlets, each divided into two annuli, equal size and similar appearance; 9 much narrower than 8, with 3 annuli; clitellar, and the following segments, dorsally simple, ventrally with irregular transverse grooves. Segmentation of juveniles removed from the cocoon: 1–3 large, simple; 4–9 with 2 simple ringlets, each ringlet twice as long as the following segments 10–30; subsequent segments very narrow, diminishing in size. *Setae*: Minute; first pairs on 3, noticeable only under high magnification; the following slightly larger, on second annuli of first ringlet on all annulated segments; on clitellar and postclitellar segments much larger; *aa* = *bc*, *dd* = 1/2 *u*. *Nephridial pores*: Conspicuous, in *c* setal lines; first pair in 2/3 intersegmental furrow. Obvious on juveniles. *Female pores*: Conspicuous, on 14 in front of *b* setae. *Male pores*: Not detected externally (presumably in 17/18 as Michaelsen supposed); vasa deferentia were not detected in dissected specimens. *Spermathecal pores*: In 12/13, 13/14, 14/15, 15/16; sometimes additional row in 16/17; conspicuous, lenticular; 2–16 laterally on each side. When numbers smaller than 16 were observed it is likely that there were additional spermathecal pores embedded in the body tissue; the average number seen was 12–14.

Clitellar region: *Clitellum*: Saddle-shaped, extending with no clear border up to ventral side, ending slightly above *b* setal lines; on 10–30 with position very constant; when well developed, yellowish-grey; before full maturity or when regressed, dark brown with blackish tint. *Tubercula pubertatis* (Fig. 4): Prominent, segmented and demarcated by irregular grooves; glandular; dorsally separated from clitellum by narrow folds but not rimmed; on 16, 1/*n* 16–1/*n* 20, 20; extended between *bc* setal lines; laterally extended, mostly on 17–19. *Papillae* (Fig. 5): Usually two large pairs, with small nipples; in *ab* setal lines, on 10 and 23 or 29; sometimes additional pair or single papilla on 11; in number equal to genital glands; all or some of them consist of genital setae.

Internal characters

Septa: 7/8 and 8/9 very much thickened, muscular, massive; usually both of equal size, sometimes 7/8 much thicker than 8/9; other septa thin, not muscular. *Gizzard*: In 7, globular, large. *Calciferous glands*: Large, closely adherent to oesophagus, united as a single rounded organ, dorsally with tiny vestigial groove; in 9–10, with septum 9/10 attached in middle part; lamellar. *Intestine*: Commences in 12; with thick typhlosole. *Dorsal blood vessel*: doubled in 4–9; 4–6 doubled, not separated; in 7 *circa* 3/5 of the length, in posterior part, doubled, not separated; in 8





Figs 4–6. *Microchaetus papillatus* Benham, 1892. 4. Tuberculum pubertatis. 5. Papilla of segment 10. 6. Cocoon.

doubled, separated; 9 – large cordiform organ, externally adherent to calciferous glands; crossing septa always single; 10 and subsequent segments, single, very much thickened. *Paired dorso-ventral commissural vessels*: 4–7 thin tubes; 8–11 moniliform; thin in 8, increasing in thickness, most prominent in 11. *Nephridia*: Meganephridia, with large, coiled loops and very large, sometimes wavy, V-shaped caeca.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement; in 10 and 11; two pairs, large, enclosed in separated sacs, connected to vesicula seminales. *Seminal vesicles*: In 10 and 11, projecting into 11 and 12 respectively; usually large sacs. *Spermathecae*: Tiny ampullae, embedded deeply in body tissue, close to septa 12/13, 13/14, 14/15, 15/16 (sometimes there are a few ampullae in 16/17); 2–16 at each side, with variable number per segment; very difficult to trace, and for this reason the exact number is uncertain. *Genital glands*: Equal in number to papillae; in 10, 23, 29; paired or single; hemispherical, four divisions, square or oval; always flat.

Biological notes: Found in primary grassland, fallow ground or in cultivated grassland (lawns, golf-courses, sports-fields), or where soil is undisturbed. Occurs in large numbers in some areas, discarding large casts on the surface; these mounds accumulate at the same place over many days, new excrements being added to those already existing. When freshly produced casts are removed, the tails of specimens can be seen. The worms, however, immediately withdraw into their long tunnels which have the form of alternating vertical and horizontal shafts. After heavy rain worms may be seen on the surface; sometimes moving onto roads or pavements.

The cocoons (Fig. 6) are the largest known in the Microchaetidae. In life they may reach 54 mm long and 27 mm wide. One of the dissected cocoons contained 5 juvenile specimens, which were *ca.* 50 mm long and 5 mm wide. Specimens were partly covered with soil, and soil was found inside the cocoon.

A number of fully clitellate specimens was collected between December and March, ie. during the rainy season; cocoons with developing worms were found in December and January. Aestivating specimens were collected from the dry bed of a stream at the end of October and in November.

Microchaetus parvus Michaelsen, 1913

Microchaetus parvus Michaelsen, 1913*c*: 445; 1918: 331; Reynolds & Cook, 1976: 152; Plisko, 1991*a*: 279. Type NMSA.

Michaelsen (1913*c*) erroneously characterised this species as proandric. I examined the holotype, compared it to material collected near the type locality, and established species as holandric, though spermiductal funnels were not seen in type material (Plisko 1991*a*). Newly collected material confirms its holandric condition.

Material examined: Natal: Nottingham Rd. (29°21′S:30°00′E) pasture, on the bank of local stream, 23 October 1990, 4 clitellate, NMSA/Olig.00781. Pietermaritzburg (29°36′S:30°24′E): Bisley, on the bank of local stream, from muddy soil, 9 February 1989, 3 semimature, NMSA/Olig.00329. Durban (29°53′S:31°00′E) on the bank of Umgeni River: from sandy soil, 8 May 1989, 6 mature and 9 juveniles, NMSA/ Olig.00330; from flooded area, 6 December 1989, 2 clitellate, NMSA/Olig.00841. Eastwolds (30°00′S:29°55′E), *ca.* 30 km NW of Ixpopo along the road to Bulwer, from fallow ground, 29 January 1991, 1 clitellate and 1 juvenile, NMSA/Olig.00744. Vernon Crookes Nature Reserve (30°18′S:30°40′E): primary grassland, excavated by bulldozer, 23 November 1989, 3 clitellate, NMSA/Olig.00753; 4 km NE of Tourist Camp, primary grassland, 22 November 1989, NMSA/Olig.00758; 6 km N of Tourist Camp, primary grassland, 22–23 November, 4 semimature and 3 juveniles, NMSA/Olig.00763, 767; 5 km W of Tourist Camp, at *ca.* 45 cm depth, 8 March 1989, 2 semimature, NMSA/ Olig.00825; all material collected by JDP.

Recorded widely in Natal. Found in various natural and cultivated biotopes (Plisko 1991*a*).

Microchaetus vernoni sp. n.

Figs 7–9. Tab. 2

Etymology: Named after the late Mr Vernon Crookes who donated property for the development of the Vernon Crookes Nature Reserve.

Material examined: Natal: Vernon Crookes Nature Reserve (30°18′S:30°40′E) primary grassland near water reservoir, excavated by a bulldozer: 23 November 1989, 1 mature holotype specimen, abscised at 799 segment, 8 paratypes, abscised at different length and 1 cocoon. Other paratypes collected from neighbourhood of the type locality: 1 juvenile from near compost at Tourist Camp, 7 March

1989; 1 semimature, consisting 1264 segments, found coiled in aestivation, 5 km W of Tourist Camp, 8 March 1989. Other 8 specimens, abscised or autotomised at different parts of the body, collected 22–23 November 1989 from locus typicus and nearby area. All material collected by JDP. Holotype – NMSA/Olig.00449, paratypes – NMSA/Olig.00442, 445, 446, 448, 461, 656, 752 and 745 – cocoon; other material: NMSA/Olig.00447, 738, 743, 746.

Known only from Vernon Crookes Nature Reserve.

External characters

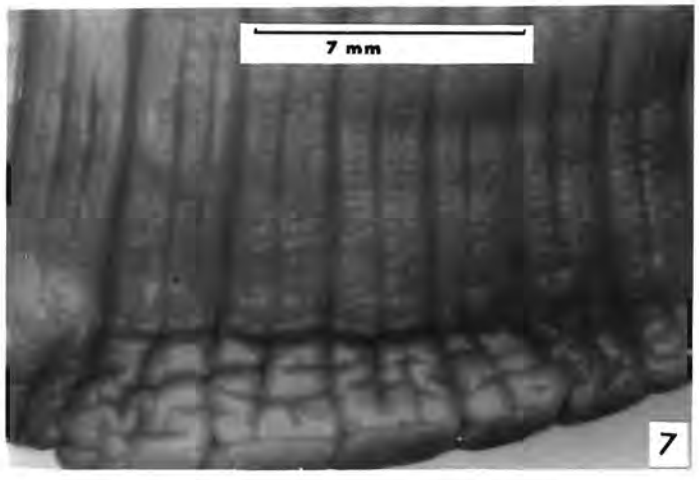
General: Body cylindrical, flattened preclitellarly and in clitellar region. *Colour*: In life dorsally brown-grey with violet tint; ventrally light grey. Alcohol preserved dorsally dark grey with violet tint, ventrally light greyish. *Dimensions*: Alive and stretched, mature: 700–2600 mm long; 9 mm wide at 10 and 12 mm at tubercula pubertatis. Preserved and contracted 500–1120 mm long; 10–15 mm wide at 10, 15–19 mm at tubercula pubertatis. *Segments number*: 760–1264 + (complete number was not established, due to specimens autotomisation during collection or preservation). *Prostomium*: Prolobous. *Segmentation*: 1–2 simple with many short longitudinal grooves; 3 simple, with incomplete longitudinal and transverse grooves; 4–9 with 2 ringlets, each divided into two annuli, all equal size and similar appearance; 10–11 with 3 narrow dorsal annuli; clitellar segments dorsally simple, ventrally with irregular longitudinal and vertical grooves. *Setae*: Minute; first pairs on 3, than on second annuli of first ringlet of all ringleted segments; on other segments medially; *ab* = *cd*, *aa* = 2*bc*, *dd circa* 1/2 *u*. *Nephridial pores*: Conspicuous; first pair in 2/3 intersegmental furrow in *cd* setal lines. *Female pores*: Minute, on 14, on anterior part of the segment. *Male pores*: Very difficult to trace, probably on 18 or 18/19, on tubercula pubertatis, where glandular folds are slightly swollen. *Spermathecal pores*: Very small ampulla-shaped, in groups of 2–3 in 12/13, 13/14, 14/15 intersegmental furrows.

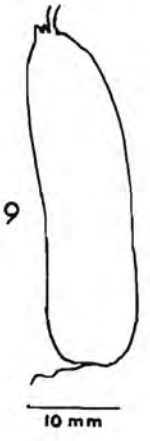
Clitellar region: *Clitellum*: Thick, saddle-shaped, divided by intersegmental furrows; yellowish-grey; extends slightly below of *c* setal lines; on 12–31, 1/*n* 32; commencing and terminating gradually, on 12–13 and 30–32, occupying less than 1/2 of *u*. *Tubercula pubertatis* (Fig. 7): On 16–19, 1/*n* 20; oblong, glandular, with irregular, longitudinal and vertical grooves; separated from clitellum by shallow furrow and the rim; ventrally extend up to the rows of papillae. *Papillae*: In *ab* setal lines, however, usually only *a* seta is covered by glandular structure; corresponding with genital glands; on 10–15 usually smaller than 16–18 which are large, oval; 19–23 minute, sometimes absent; 24–29 large, gradually diminishing in size.

Internal characters

Septa: 4/5 thickened moderately, elastic, strong; 5/6 very much thickened, massive, muscular; 6/7 very thin, delicate; 7/8 and 8/9 thickened moderately, but thicker than 4/5; other septa thin, but strong. *Gizzard*: Oblong, large; in 7. *Calciferous glands*: In 9–10; nearly cylindrical organ, dorsally with vestigial, narrow furrow, ventrally united; thick, closely adherent to oesophagus; lamellar. *Intestine*:

Commences in 13; with thick typhlosole. *Dorsal blood vessel*: In 4–9 doubled, joined at septa; 4–5 partly doubled, close; 6 doubled, separated; in 7 partly doubled, close or slightly separated; 8 doubled, separated; 9 cordiform organ; 10 and the following single, thought in 10 and 11 slightly thickened. *Paired dorso-ventral commissural vessels*: In 4–7 thin tubes, 8–11 moniliform, gradually enlarged. *Nephridia*: Meganephridia; one pair per segment of massive coiled loops with large caeca.





Figs 7–9. *Microchaetus vernoni* sp. n. 7. Tuberculum pubertatis. 8. Casts deposited on the surface of primary grassland. 9. Cocoon.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement, in 10 and 11; two pairs, each enclosed in two separated, large and very thick sacs, communicating with vesiculae seminales. *Seminal vesicles*: In 11 and 12; two pairs L-shaped sacs projecting into neighbouring segments. *Spermathecae*: Small, banded or looped tube-shaped ampullae; near septa 12/13, 13/14, 14/15; 2–3 at each side, sometimes not equal number at each side. *Genital glands*: Corresponding in number with papillae. In 10–15 usually small, flat, three-divisions; 16–18 large, oblong, three or four sausage-shaped; 24–29 large, similar appearance to these of 16–18.

Biological notes: Found in a thick layer of black soil overlying on red, coarse soil in primary grassland, riverine bush, or in the gardens of Vernon Crookes Nature Reserve. Grasses cover hundreds of large casts (Fig. 8), whose dimensions can be 120 mm in diameter and 240 mm high. The formation of mounds resembles the accumulation of casts on Kommetjie Flats at Debe Nek in the Eastern Cape Province, observed recently by myself, and those described by Pickford (1926) and Ljungström & Reinecke (1969). The production of mounds is greatest during the rainy season; during dry months some freshly made casts were found only near water reservoirs, moist river beds or in watered gardens. The posterior part of the body may be seen when freshly made casts are moved. Captured specimens easily autotomise. Material for this study was excavated with a bulldozer, specimens being extracted from long tunnels reaching up to 85 cm in depth, made up of alternating vertical and horizontal shafts. Fully mature clitellate specimens and a cocoon (Fig. 9) were collected in November. An aestivating specimen was found in March, in semi-dry soil, at a depth of *ca.* 50 cm.

A comparative study on casts and surrounding soil, conducted in the Soil Science Laboratory at Cedara Agricultural College, shows that casts are rich in organic carbon, ammonium nitrogen, calcium, magnesium, potassium, phosphorus and zinc (Table 2).

Discussion: *M. vernoni* is related to *microchaetus*, *decipiens*, *braunsi*, *stuckenbergi* and *klopperi*. These species are all gigantic, each worm has more than 500 segments (some species attain more than 1000), and a long clitellum occupying a number of segments. Each has the dorsal blood vessel doubled. They differ, however, in the position of the clitellum, tubercula pubertatis and genital glands, as well as in the number and position of spermathecae. Calciferous glands in *vernoni* are united, forming a nearly cylindrical organ, with a tiny vestigial groove dorsally, closely resembling those described by Pickford (1975) for *crousi* and *guntheri*.

M. vernoni is the longest species, with the highest number of segments, of Microchaetidae known from South Africa.

Microchaetus zaloumisi sp. n.

Figs 10–11

Etymology: Named for Mr G. Zaloumis, who was Ranger-in-charge at Vernon Crookes Nature Reserve.

Material examined: Natal: Vernon Crookes Nature Reserve (30°18'S:30°40'E) riverine bush in indigenous forest, from wet, black soil, 8 March 1989, JDP leg. Holotype NMSA/Olig.00751.

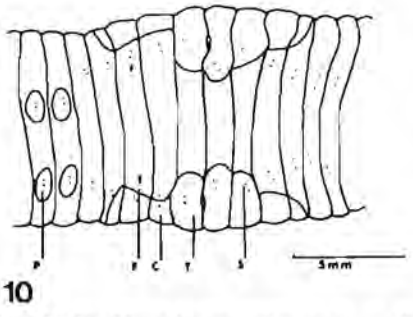
External characters

General: Body cylindrical. *Colour*: In life dorsally violet, ventrally grey. Alcohol preserved dorsally violet-grey, ventrally light grey. *Dimensions*: Preserved and slightly contracted 118 mm long, 7 mm wide at 10, 9 mm at tubercula pubertatis. *Segments number*: 157. *Prostomium*: Prolobous. *Segmentation*: 1–2 simple with irregular longitudinal grooves; 3 simple; 4–9 with 2 simple ringlets equal size and similar appearance, postclitellarly diminishing in size. *Setae*: Minute anteriorly, enlarged at clitellar region and modest posteriorly; closely paired, with changeable distances between *aa* and *bc* setal lines on clitellar segments. First pairs on 4. *Nephridial pores*: minute; first pair in 3/4 intersegmental furrow. *Female pores*: Conspicuous, on 14 below of *a* setal lines. *Male pores*: Conspicuous, with glands; in 16/17 intersegmental furrow. *Spermathecal pores*: In 13/14; small lenticular, inconspicuous.

Clitellar region (Fig. 10): *Clitellum*: Segmented; whitish-grey; on 1/4 13–20, laterally extended slightly below *cd* setal lines; not clearly distinct from tubercula pubertatis or papillae. *Tubercula pubertatis* (Fig. 11): Smooth tubercles, below cd setal lines, slightly overlapping clitellum; on 16–17 (18); genital fields extended up to medial line. *Papillae*: Not clearly distinct glandular swellings, on 10–20.

Internal characters

Septa: 4/5 slightly thickened; 5/6 and 6/7 very thin, delicate; 7/8 and 8/9 moderately thickened, not muscular; other septa thin. *Gizzard*: Globular, in 7. *Calciferous glands*: In 9; laterally adherent, clearly separated dorsally and ventrally. *Intestine*: Commences in 13, with thick typhlosole. *Dorsal blood vessel*: Single in 5–6 and at crossing septa; partly doubled, not separated in 7; doubled, separated in 8; thick, cordiform in 9; in 10 and the following single. *Paired dorso-ventral commissural vessels*: 5–8 thin tubes; 9–11 moniliform, prominent. *Nephridia*: Meganephridia; coiled loops with oblong caeca.



10


11

Figs 10–11. *Microchaetus zaloumisi* sp. n. 10. Clitellar region, ventral. C = clitellum; T = tuberculum pubertatis; F = female porus; S = setae; P = papilla of segment 10. 11. Tuberculum pubertatis, laterally.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement; in 10 and 11; two pairs, each enclosed in thin sac, closely corresponding with vesiculae seminales. *Seminal vesicles*: In 10 and 11; a single sac; dorsally, protruding laterally as auriform sacs in 11, projecting into 12. *Spermathecae*: Oblong tubes, conspicuous; 5 at each side, in only one segment close to septum 13/14. *Genital glands*: Irregularly shaped, with three- or four-divisions, flat.

Discussion: Related to *natalensis* with noticeable similarity in general appearance, dimensions, low number of segments, shape of calciferous glands, and position of male pores. Differs in shape and position of clitellum, tubercula pubertatis, papillae, genital glands, arrangement of setae at clitellar region, and number of spermathaecae.

Proandricus gen. n.

Type species: *P. thornvillensis* sp. n. by present designation.

Etymology: Gr. Masculine. From the word proandric meaning the presence of a single pair of testes in segment 10.

Preclitellar segments with secondary, external annulation. Setae lumbricine, paired; *dd circa* 1/2 *u*. Dorsal pores absent. Nephropores in or near *cd* setal lines. Paired female pores on 14. Male pores intraclitellar. Clitellum saddle-shaped; tubercula pubertatis present; papillae and genital fields present or absent.

One oesophageal gizzard in segment 7; calciferous glands present, in region of 9–10. Dorsal blood vessel in preclitellar segments single, partly doubled or doubled, always single where crossing septa. One pair of nephridia per segment, each with much coiled loops and caecum. Proandric; spermiductal funnels free or in sacs. Spermathecae one to several on each side per segment. Genital glands present or absent. Prostate absent.

Terrestrial; some species found in muddy, wet biotopes. Known only from South Africa; 17 species.

Key to species of *Proandricus* gen. n.

1 Only two septa thickened 2
– More than two septa thickened 8

2 Septa 7/8 and 8/9 thickened; other septa thin or rudimentary. Spermathecal pores in intersegmental furrows 11/12 and 12/13 3
– Septa 10/11 and 11/12 thickened; other septa thin; clitellum on 12–26 ..... **brincki** (Sciacchitano, 1960)

3 Clitellum commences on 13 segment 4
– Clitellum commences on 14 segment 7

4 Clitellum on 13–23; tubercula pubertatis on 17–20, wings-shaped, protruding laterally, separated from clitellum by furrows ..... **thornvillensis** sp. n.
– Tubercula pubertatis plain, rimmed or not 5

5 Clitellum on 13–21 6
– Clitellum on 1/*n* 13–23; tubercula pubertatis on 17–1/*n* 20, rimmed laterally;

prominent genital fields between tubercula pubertatis ... **entumeni** sp. n.
– Clitellum on 13–25; tubercula pubertatis on 1/*n* 16–1/*n* 20, no genital fields **babanango** sp. n.

6 Pigmented, firm; tubercula pubertatis on 1/*n* 16–19 ..... **jasoni** sp. n.
– Unpigmented, soft, plump; tubercula pubertatis on 1/*n* 16–1/*n* 20 ..... **bulwerensis** sp. n.

7 Clitellum on 14–23; tubercula pubertatis on 17–19 ..... **gracilis** (Michaelsen, 1907)
– Clitellum on 14–23; tubercula pubertatis on 14–19 **colletti** (Beddard, 1907)

8 Septa 4/5, 7/8, 8/9 thickened 9
– Septa 4/5, 5/6, 7/8, 8/9 ..... **marleyi** (Michaelsen, 1928)

9 Spermathecal pores in one intersegmental furrow 12/13; clitellum on 12–20; tubercula pubertatis on 15–17 ..... **warreni** (Michaelsen, 1913)
– Spermathecal pores in more than one intersegmental furrows 10

10 Spermathecal pores in two intersegmental furrows 11
– Spermathecal pores in three intersegmental furrows: 11/12, 12/13, 13/14; clitellum on 12–21; tubercula pubertatis on 14–20 ..... **timmianus** (Michaelsen, 1933)

11 Spermathecal pores in 9/10 and 10/11; clitellum on 12–21; tubercula pubertatis on 16–20 ..... **lesothoensis** (Reinecke & Ryke, 1969)
– Spermathecal pores in 11/12 and 12/13 12
– Spermathecal pores in 12/13 and 13/14 13

12 Clitellum on 11, 12–25; tubercula pubertatis on 14–19, 20 ..... **modestus** (Michaelsen, 1899)
– Clitellum on 13–1/2 22; tubercula pubertatis on 15–18 ..... **belli** (Benham, 1892)

13 Clitellum on (?)11, 12–22, 23; tubercula pubertatis on 14–18, 19 ..... **beddardi** (Benham, 1886)
– Clitellum on 12–21, 22; tubercula pubertatis on 15–19, 20; male pores in 14/15 ..... **marenzelleri** (Rosa, 1897)
– Clitellum on 12–22; tubercula pubertatis on 14–17; male pores in 15/16 ..... **humicultor** (Michaelsen, 1912)

Proandricus babanango sp. n.

Figs 12–13

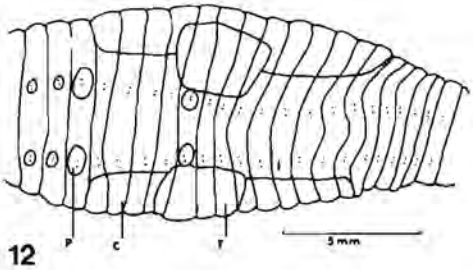
Etymology: Named after the type locality of Babanango.

Material examined: Natal: (Zululand) 7 km SE of Babanango (28°23′S:31°05′E), grassland, moist soil at *ca.* 35 cm depth; 1 mature holotype specimen, 1 paratype abscised postclitellarly, 4 juveniles and 2 abscised posterior parts; 3 December 1990, JDP & B. R. Stuckenberg leg. Holotype NMSA/Olig.00701, paratypes NMSA/Olig.00773 and NMSA/Olig.00774.

External characters

General: Body cylindrical, in life firm and muscular. Preserved in alcohol anterior part firm; postclitellar part slightly softened. *Colour*: In life dorsally violet with brownish tint; ventrally grey. Alcohol preserved: dorsally, up to *d* setal lines, violet with red tint; ventrally yellowish-grey. *Dimensions*: Holotype preserved and contracted 250 mm long, 6 mm wide at 10, 9 mm at tubercula pubertatis. *Segments number*: Holotype 514. *Prostomium*: Prolobous, minute. *Segmentation*: 1 and 2 simple with longitudinal grooves; 3 simple; 4–11 with two simple ringlets, equal size and similar appearance. *Setae*: First pairs on 3, than on first ringlet of all ringleted segments. *Nephridial pores*: Minute; first pair in 3/4 intersegmental furrow, in *cd* setal lines. *Female pores*: A pair on 14. *Male pores*: In 17/18 intersegmental furrow, minute. *Spermathecal pores*: In 11/12 and 12/13 intersegmental furrows, 2 at each side.

Clitellar region (Fig. 12): *Clitellum*: Saddle-shaped, segmented, (brown; on 13–25. *Tubercula pubertatis* (Fig. 13): Broad, rectangular, divided by intersegmental furrows, yellow; on 1/*n* 16–1/*n* 20. *Papillae*: Small on 10 and 11, large on 12, medium on 17; in *ab* setal lines.



Figs 12–13. *Proandricus babanango* sp. n. 12. Clitellar region, ventral. C = clitellum; T = tuberculum pubertatis; P = papilla of segment 12. 13. Tuberculum pubertatis.

Internal characters

Septa: 4/5–6/7 very thin, delicate; 7/8 and 8/9 very much thickened, muscular. *Gizzard*: In 7, oblong, muscular. *Calciferous glands*: A pair, laterally adherent to oesophagus, with narrow grooves dividing glands dorsally and ventrally; in 9. *Intestine*: Commences in 13, with no typhlosole. *Dorsal blood vessel*: doubled in 5–9: in 5–7 partly doubled, not separated; 8 doubled, separated; 9 cordiform; crossing septa and as from 10 single. *Paired dorso-ventral commissural vessels*: in 7–11; 5–8 thin tubes, 9–11 moniliform hearts. *Nephridia*: Meganephridia with thin coiled loops and oblong caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement; one pair enclosed into one, very thin testis sac in 10. *Vasa deferentia*: Obvious single ducts, running up to 17 where going into body wall. *Seminal vesicles*: One pair in 10, projecting into 11; small. *Spermathecae*: S shaped, near 11/12 and 12/13 septa; 2 at each side. *Genital glands*: In 10, 11, 12 three-divisions, finger-shaped, medium; 16–19 large, oblong, coiled glands.

Biological notes: Found under large, partly dry cast, with freshly added deposits. Surrounding area was covered by similar casts.

Discussion: Related to *marleyi*. Differs in body dimensions and thickness of septa; new species is much larger, septa 4/5 and 5/6 are not thickened, whereas in *marleyi* they are much thickened.

Proandricus beddardi (Benham, 1892) **comb. n.**

Figs 14–17

Microchaeta beddardi Benham, 1886*b*: 78; Benham, 1892: 142; Beddard, 1895: 672; Reynolds & Cook, 1976: 77.
Microchaetus beddardi; Michaelsen, 1900: 449; 1918: 327.

Original description based on six specimens from the locality described as 'Natal'. Type depositary unknown (Reynolds Cook 1976).

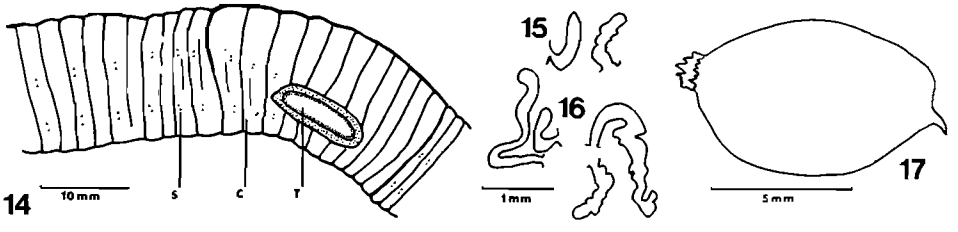
Material examined: Natal: 50 km S of Mkuze, along N2 (27°47'S:32°10'E) grassland, near small swamp, 11 clitellate, 2 juveniles, NMSA/Olig.00623. Hluhluwe area (27°58'S:32°12'E) on the bank of Ngweni River from soil rich in organic matter, 8 clitellate, 33 juveniles, 2 cocoons, NMSA/Olig.00624; both samples collected 23 February 1990 by JDP & J. Turner.

Known only from Natal.

External characters

General: Body cylindrical, in life firm. Preserved in alcohol softened. *Colour*: In life dorsally violet, ventrally greyish. Alcohol preserved dark grey with brown-violet tint. *Dimensions*: Preserved and contracted 165–220 mm long; 4 mm wide at 10, 5 mm at tubercula pubertatis. *Segments number*: 230–251. *Prostomium*: Prolobous. *Segmentation*: 1–3 simple, 4–9 with two simple ringlets. 10 and following segments simple, with random transverse grooves. *Setae*: Minute, first pairs on 2, than on first ringlet of ringleted segments. *Female pores*: Not visible. *Male pores*: Not detected. *Spermathecal pores*: In 11/12 and 12/13 in *cd* setal lines.

Clitellar region (Fig. 14): *Clitellum*: Yellow-brown, segmented; on 12–22, 23 not clearly bordered laterally. *Tubercula pubertatis*: Oblong bands on 14–18, 19, between *bc* setal lines, clearly rimmed.



Figs 14–17. *Proandricus beddardi* (Benham, 1892). 14. Clitellar region, lateral. C = clitellum; T = tuberculum pubertatis; S = setae. 15–16. Spermathecae. 15. From segment 11. 16. From segment 13. 17. Cocoon.

Internal characters

Septa: 4/5 very much thickened; 5/6 and 6/7 very thin; 7/8 and 8/9 thickened, however, slightly thinner than 4/5. *Gizzard*: In 7, oval. *Calciferous glands*: In 9–10, laterally adherent to oesophagus, clearly separated dorsally and ventrally. *Intestine*: Commences in 13. *Dorsal blood vessel*: Single in 5–6, doubled in 7–8, 9 cordiform, in 10 very much thickened. *Nephridia*: Meganephridia, with coiled loops and clear caeca. Nephropores in *c* setal lines.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement, in 10. *Seminal vesicles*: One pair in 11. *Spermathecae* (Figs 15–16): In 11 and 13, close to septa 11/12 and 12/13. Various shape and not equal size; oblong simple tubes or slightly coiled; 1–2 spermathecae at each side.

Biological notes: Found in moist soil, rich in humus, on the bank of the Ngweni River and in adjacent grassland. A number of clitellate specimens and large juveniles collected in February. A few partly developed cocoons (Fig. 17) were present.

Proandricus bulwerensis sp. n.

Figs 18–19

Etymology: Named after the town of Bulwer near the type locality.

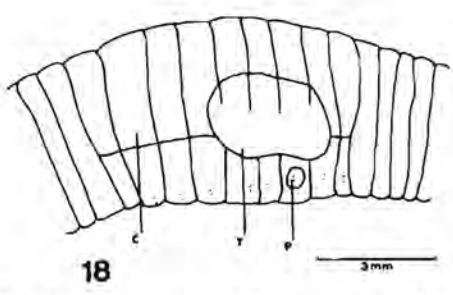
Material examined: Natal: Eastwolds (30°00'S:29°55'E) *ca.* 30 km NW of Ixopo, on the road to Bulwer; from fallow ground, 1 holotype, mature specimen abscised at segment 316, and 4 paratypes abscised at 154–203 segments, 29 January 1991, JDP leg. Holotype NMSA/Olig.00731, paratypes NMSA/Olig.00732.

Recorded only from one locality in southern Natal.

External characters

General: Body cylindrical, in life plump, soft. Preserved in alcohol softened, slightly stretched. *Colour*: In life pinkish-grey; alcohol preserved preclitellarly grey with pink tint. *Dimensions*: Abscised part of the holotype preserved and stretched, 150 mm long, 4 mm wide at 10, 10 mm at tubercula pubertatis; all paratypes abscised measure in length 90–125 mm. *Segments number*: Holotype 316 +; paratypes 154–203 +; the exact segments number is unknown as all specimens abscised during collection. *Prostomium*: Prolobous, not clearly separated from first segment. *Segmentation*: 1–2 not clearly separated each from another; short, with longitudinal grooves; 3 simple; 4–8 with 2 simple ringlets, equal size and similar appearance; 8–9 with 2 annulated ringlets; 9–11 annulated or simple, with transverse grooves. *Setae*: Closely paired; first pairs on 3. *Nephridial pores*: Conspicuous in *cd* setal lines; first pair in 2/3 intersegmental furrow. *Female pores*: A pair of small openings on 14, between *bc* setal lines. *Male pores*: On 17, in area of tubercula pubertatis. *Spermathecal pores*: two pores at each side, close to intersegmental furrows 11/12 and 12/13.

Clitellar region (Fig. 18): *Clitellum*: Saddle shaped, white-grey, divided by intersegmental furrows; on 13–21. *Tubercula pubertatis* (Fig. 19): Broad, divided by intersegmental furrows; on 1/*n* 16–1/*n* 20, occupying partly space between *bc*



Figs 18–19. *Proandricus bulwerensis* sp. n. 18. Clitellar region, lateral. C = clitellum; T = tuberculum pubertatis; P = papilla. 19. Tuberculum pubertatis, ventral.

setal lines; separated from clitellum by oblong rim; medially bordered irregularly; however, on one, fully mature paratype specimen, the whole tuberculum pubertatis is clearly demarcated by narrow rim. *Papillae*: On 12 small, oval glands; on 19 much larger, glandular.

Internal characters

Septa: 4/5–6/7 thin, delicate; 7/8 and 8/9 very much thickened, muscular. *Gizzard*: In 7; globular. *Calciferous glands*: In 9; a pair, laterally adherent to oesophagus, clearly separated dorsally and ventrally. *Intestine*: Commences in 13; with thick typhlosole, manifesting externally at 20 with short, white diverticula. Internally typhlosole large, simple, tube. *Dorsal blood vessel*: Doubled in 5–9; in 5–6 doubled, separated; 7 partly doubled, close; 8 doubled, separated; 9 cordiform; 10 and subsequent segments single. *Paired dorso-ventral commissural vessels*: 5–7 thin tubes; 8–11 moniliform, changing progressively in their thickness. *Nephridia*: Meganephridia; coiled loops with V-shaped, short caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement; one pair in 10; enclosed in testis sacs: the base of funnels adherent to the sacs, which are closely connected to vesicula seminales. *Seminal vesicles*: One pair in 11, pushing septa into 12; large, folded oblong sacs corresponding with testis sacs. *Spermathecae*: Oblong-shaped ampullae with thin neck; 2 at each side; close to septa 11/12 and 12/13. *Ovaries*: In 13; rosette-shaped. *Genital glands*: In 19, projecting into 18–16 segments; two at each side, very long, sausage-shaped, looped glands. In one paratype some abnormality was observed: one of the pair was cross-positioned, that from left side goes under intestine to the right side, and that from right side goes to the left side.

Discussion: Related to *marenzelleri*, a species recorded only from Cape Province. Differs in the position of clitellum and tubercula pubertatis.

Proandricus colletti (Beddard, 1907) **comb. n.**

Microchaetus colletti, Beddard, 1907: 277; Michaelsen, 1913*c*: 442; 1918: 330; Reynolds & Cook, 1976: 89.
Microchaeta colletti; Coles, 1989: 299.

Known from the unique type specimen, collected in northern Natal (Zululand)

with no specified locality; original description is not in accord with the drawing published in Beddard's paper, and therefore it is difficult to establish the characters of the species.

Michaelsen (1913*c*) revising the type material has noticed that *colletti*, *gracilis* and *ivari* are closely related to each other or probably conspecific. Not having sufficient comparable material, he wrote: 'We might perhaps be justified in uniting these three species into one, *M. colletti* Beddard, and to consider the examples from Natal as varieties of Beddard's Zululand species, which has the priority. But with the material at hand I think it best to keep them separated provisionally'. Since Michaelsen's revision no new material of these three species has been collected. The descriptions of *gracilis* and *ivari* do not provide sufficient evidence to distinguish these two species; *colletti*, however, differs from *gracilis* and *ivari* in the position of tubercula pubertatis, therefore I suggest that *colletti* should be kept as a separate species, while *ivari* can be accepted as a synonym of *gracilis*.

Unfortunately, type material of *gracilis* and *ivari* cannot be located (Reynolds & Cook 1976). Coles (1989) has commented that *colletti* was 'not found' in Beddard's type material in BMNH. Checking the Microchaetidae in this collection I too could not find it.

Proandricus entumeni sp. n.

Figs 20–22

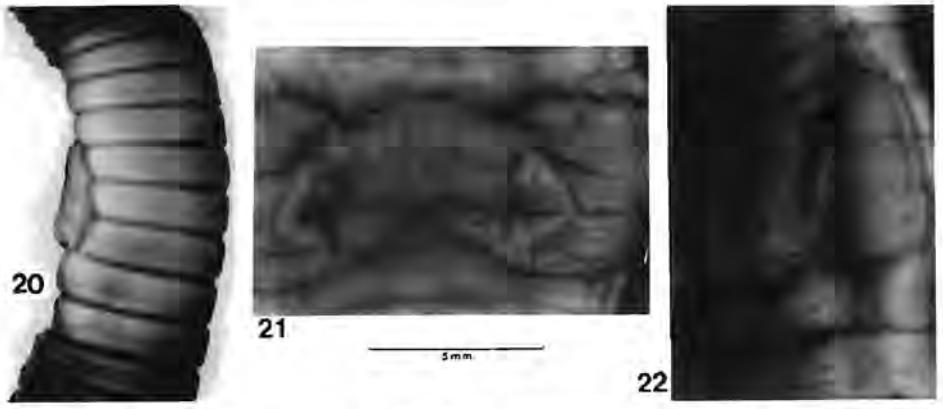
Etymology: Named after the type locality, Entumeni Nature Reserve.

Material examined: Natal: (Zululand) 12 km W of Eshowe (28°54'S:31°28'E) on the road to Nkandla, from indigenous forest in Entumeni Nature Reserve: *ca.* 1 km from camping area, on walking path and near camping site, from dry soil, 1 mature holotype specimen abscised at 74 segment, 2 clitellate paratypes, abscised at 76 and 136 segment, 3 juveniles, 2 abscised anterior and 2 posterior parts; 1 February 1989, JDP & B. R. Stuckenberg leg. Holotype NMSA/Olig. 00339, paratypes NMSA/ Olig.00340 and NMSA/Olig.00717.

Known only from the type locality.

External characters

General: Body cylindrical, slightly flattened in clitellar region. *Colour*: In life: dorsally, up to *cd* setal lines, violet with reddish tint, ventrally grey. Alcohol preserved: dorsally and preclitellarly violet, ventrally yellowish-grey. *Dimensions*: Holotype: preserved, 70 + mm long; paratype: 140 + mm long; both 7 mm wide at 10, 11–13 mm at tubercula pubertatis; juveniles 105–160 mm long, 4–5 mm wide. *Segments number*: 136 +; the complete number unknown in mature specimens; juveniles 219–353. *Prostomium*: Prolobous. *Segmentation*: Segment 1 and 2 simple, equal size and appearance, with longitudinal lines; 3 larger than 1 or 2, simple; 4–6 with two simple, equal size ringlets, each ringlet large as segment 3; 7–9 with two ringlets, each with two or three annuli; 10–12 ventrally with irregular grooves; postclitellar simple. *Setae*: Small; first pairs on 3. *Nephridial pores*: First pair in 2/3 intersegmental furrow, in *cd* setal lines. *Female*



Figs 20–22. *Proandricus entumeni* sp. n. 20. Clitellar region, dorsolaterally. 21. Genital fields. 22. Tuberculum pubertatis.

pores: On 14 between *b c* setal lines; tiny. *Male pores*: In 18/19 intersegmental furrow, on genital fields. *Spermathecal pores*: In 11/12 and 12/13 intersegmental furrows; 3 pore at each side.

Clitellar region (Figs 20–22): *Clitellum*: yellowish-light brown, segmented; on 1/*n* 13–23. *Tubercula pubertatis* with genital fields: Bean- or oval-shaped, broad, white, segmented; clearly separated from clitellum and genital fields by deep furrow; on 17–1/*n* 20. Genital fields white, longitudinally wrinkled swellings, between tubercula pubertatis.

Internal characters

Septa: 4/5–6/7 thin; 7/8 and 8/9 very much thickened, muscular. *Gizzard*: In 7; large, oblong, muscular. *Calciferous glands*: In 9; a pair, laterally adherent to oesophagus, widely separated dorsally. *Intestine*: Commences in 13; narrow typhlosole manifesting in form of six pairs irregularly-shaped diverticula, with short caeca, turned up over the intestine, in 25–30 on dorso-lateral wall of the gut. *Dorsal blood vessel*: doubled, not separated in 5–8; in 9 cordiform organ; single when crossing septa and after 9. *Nephridia*: Meganephridia, massive coiled loops ventro-laterally with short caeca; nephrostome laterally placed.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement; one pair in 10; enclosed into one testis sac, closely attached to vesiculae seminales. *Vasa deferentia*: Conspicuous, single ducts, running up to 17/18 septa, where they enter body wall tissue and male pores. *Seminal vesicles*: Large, in 11, connected to testis sacs in 10, and projecting into 12. *Spermathecae*: Variously shaped; coiled, small ampullae; 3 at each side, close to 11/12 and 12/13 septa. *Ovaries*: In 13 with long oviduct. *Genital glands*: In 10, 24 and 25; thick, oval, yellowish-white glands.

Biological notes: The species is known from two localities in one area of indigenous forest, though its presence in neighbouring areas is suspected. Many dry casts were noticed throughout the Entumeni Nature Reserve. Specimens

were dug out from under freshly made casts on a footpath. The species was active in dry, hard soil, close to surface litter.

Discussion: *P. entumeni* is related to *marleyi*. Both species have spermiductal funnels enclosed in one testis sac in segment 10, spermathecae in 11/12 and 12/13. Clitellum occupies segments 14–23, though in *entumeni* it may start in 13. Tubercula pubertatis are broad and demarcated by the rim, or furrow, on 17–19; in *entumeni* the space between the tubercula pubertatis is occupied by genital fields, whereas in *marleyi* this condition has not been reported. It is possible, however, that Michaelsen did not observe this feature as his description was of an immature specimen. Differences between *marleyi* and my new species are in the thickness of septa, dorsal blood vessel, and in the calciferous glands. Michaelsen states, for *marleyi*, septa 4/5 moderately-, 5/6 extremely-, 7/8 and 8/9 very much thickened; dorsal blood vessel single in 9–11; calciferous glands in 9 and part of 10, dorsally and ventrally nearly touching each other. In *entumeni* septa 4/5–6/7 are thin, 7/8 and 8/9 very much thickened; dorsal blood vessel is doubled in 5–9; calciferous glands in 9, widely separated dorsally and ventrally. The paratype specimen of *marleyi* deposited in the Natal Museum collection (NMSA/Olig.00261) shows thickened septum 4/5; unfortunately the other characters cannot be examined due to the poor condition of the specimen and removal of its inner parts by Michaelsen during examination.

The presence and function of diverticula in microchaetids are not yet documented. So far they have been found only in *bulwerensis* and *entumeni*.

Proandricus gracilis (Michaelsen, 1907) **comb. n.**

Microchaetus gracilis Michaelsen, 1907: 8; 1913*c*: 443; 1918: 330; Reynolds & Cook, 1976: 108. Type depositary unknown (Reynolds & Cook, 1976).
Microchaetus ivari Michaelsen, 1907: 10; 1913*c*: 444; 1918: 330; Reynolds & Cook, 1976: 119. **Syn. n.**

Known from two western Natal localities; two specimens were collected and described under two synonyms, *gracilis* and *ivari*. (See discussion under *P. colletti*).

Proandricus jasoni sp. n.

Figs 23–24

Etymology: Named for Dr Jason G. H. Londt, Assistant Director of the Natal Museum.

Material examined: Natal: Moor Park Nature Reserve, 10 km SW of Estcourt (29°05'S:29°54'E) at *ca.* 1200 m asl, riverine bush: 1 holotype, mature specimen and 1 paratype abscised at 79 segment, clitellate. 24 March 1988, JDP & J. G. H. Londt leg. Holotype NMSA/Olig.00469, paratype NMSA/Olig.00703.

Recorded only from the type locality in western Natal.

External characters

General: Body cylindrical, in life firm and muscular. Preserved in alcohol softened, slightly stretched. *Colour*: In life dorsally dark grey with violet tint;

ventrally grey. Alcohol preserved grey. *Dimensions*: Holotype preserved and stretched 250 mm long, 8 mm wide at 10, 11 mm at tubercula pubertatis; paratype (abscised) 95 + mm long. *Segments number*: Holotype 286. *Prostomium*: Prolobous, rudimentary, with a few longitudinal grooves. *Segmentation*: 1–2 short, simple, with longitudinal grooves; 3 with delicate annulation, dividing segment into two differently structured parts: first with similarity to second segment, second part similar to segment 4; 4–7 with 2 simple ringlets, equal size and similar appearance; 8–9 with 2 annulated ringlets; 10–12 with 4–5 short annuli; all clitellar segments ventrally with transverse grooves; postclitellarly all segments simple. *Setae*: Closely paired; first pairs on 3. *Nephridial pores*: Conspicuous in *cd* setal lines; first pair in 2/3 intersegmental furrow. *Female pores*: A pair of small openings on 14, between *bc* setal lines. *Male pores*: Probably in 16/17 or 17/18 intersegmental furrow, as spermiducts run up to 16, where they enter body wall. *Spermathecal pores*: 3 pores at each side, in 11/12 and 12/13 intersegmental furrows.

Clitellar region (Fig. 23): *Clitellum*: Saddle shaped, yellowish-grey, with

Figs 23–24. *Proandricus jasoni* sp. n. 23. Clitellar region, ventral. 24. Spermathecae: top, of segment 12 – lower, of 13.

intersegmental furrows; extends between *cc* setal lines; on 13–21. *Tubercula pubertatis*: Broad, oval, separated from clitellum by deep furrow, and narrow protruding rim; glandular, demarcated by longitudinal grooves and divided by intersegmental furrows; on 1/*n* 16–19, occupying the whole space between *bc* setal lines.

Internal characters

Septa: 4/5–6/7 very thin, delicate; 7/8 and 8/9 very much thickened, massive, muscular. *Gizzard*: In 7; bell-shaped, with its base slightly softened. *Calciferous glands*: In 9; a pair, laterally adherent to oesophagus, clearly separated dorsally and ventrally. *Intestine*: Commences in 13, with no typholsole. *Dorsal blood vessel*: Doubled in 5–9, 10; in 5–7 partly doubled, not separated; 8 doubled, separated; 9 cordiform; 10 short, enlarged, (doubled); crossing septa and after 10 single. *Paired dorso-ventral commissural vessels*: 5–6 thin tubes; 7–11 moniliform, progressing in thickness. *Nephridia*: Meganephridia; coiled loops with V-shaped, thick caeca.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement; one pair in 10, enclosed in one testis sac closely connected to seminal vesicles. *Seminal vesicles*: One pair in 11, pushing septa into 12; large, folded, oblong sacs corresponding with testis sac. *Spermathecae*: Irregularly shaped, large (Fig. 24); 3 at each side, close to septa 11/12 and 12/13. *Genital glands*: 2 pairs of different size and appearance, corresponding with papillae, in 10 and 25; first pair composite of 4 flat, oval-shaped divisions; second pair composed of 4 glands, which from two are L-shaped, and two J-shaped.

Discussion: *P. jasoni* is related to *gracilis* but differs in the position of the clitellum, tubercula pubertatis and unique spermathecal configuration.

Proandricus marleyi (Michaelsen, 1928) **comb. n.**

Microchaetus marleyi Michaelsen, 1928: 4; Reynolds & Cook, 1976: 134; Plisko, 1991*a*: 286. Holotype ZMUH (Reynolds Cook, 1976). Paratype NMSA/Olig. 00261.

Described on incompletely developed, abnormally stretched, badly preserved specimens, collected from northen Natal. The type locality is given as Melmoth [28°35′S:31°25′E] District. Due to the poor condition of the paratype, examination of external and internal characters was unsatisfactory (Plisko 1991*a*). The comprehensive description of the type in which its proandric characteristic was stated, allows me to place the species in *Proandricus*.

Proandricus thornvillensis sp. n.

Figs 25–26

Etymology: Named after the type locality of Thornville.

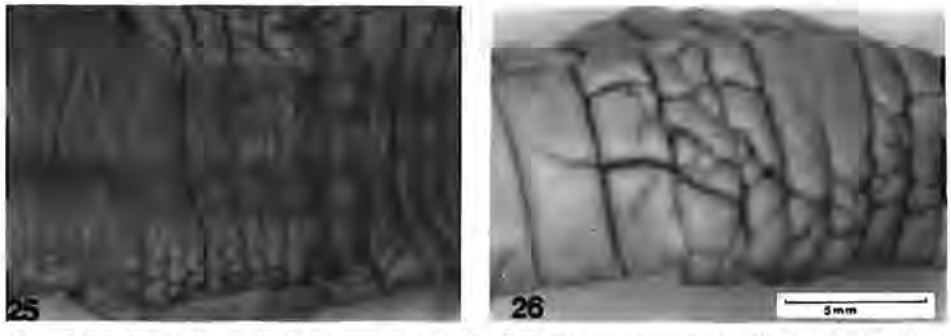
Material examined: Natal: Thornville (29°44′S:30°24′E) at the right side of the road Pietermaritzburg-Richmond, on stream bank, from wet, muddy soil, only a few cm above underground water, 20 April 1989, 1 mature holotype specimen, 4 paratypes at different developmental stages and 3 juveniles. Richmond

(29°52'S:30°16'E) on the bank of local stream, 7 December 1989, 1 clitellate and 1 juvenile. Orient Park (29°37'S:30°13'E) south side of Midmar Dam, overgrown by grassland, from wet soil at *ca.* 35 cm depth, 31 January 1991, 1 mature specimen. All material collected by JDP. Holotype NMSA/Olig.00703, paratypes NMSA/Olig.00704–00705, NMSA/Olig.00477, NMSA/Olig.00484, NMSA/Olig.00706.

External characters

General: Body cylindrical, in life firm and muscular. Preserved in alcohol slightly softened, much flattened at clitellar region. *Colour*: In life dorsally violet with brownish tint; ventrally grey. Alcohol preserved, dark grey dorsally up to *cd* setal lines; ventrally yellowish pale grey. *Dimensions*: Preserved: holotype 340 mm long, 10 mm wide at 10, 15 mm at tubercula pubertatis; paratypes 210–300 mm long, 5–8 mm wide at 10, 10 mm at tubercula pubertatis. *Segments number*: Holotype 382; paratypes 288–385. *Prostomium*: Prolobous, small. *Segmentation*: 1 and 2 simple with longitudinal grooves; 3 simple, larger than first or second; 4–6 with two ringlets, equal size and similar appearance; 7–9 with two ringlets irregularly annulated; the succeeding segments simple (there is some degree of variation in annulation of these segments: some specimens have simple segments, the other demonstrate annulation). *Setae*: Minute; first pairs on 2, then on first ringlet of all ringleted segments. *Nephridial pores*: Obvious; first pair in 2/3 intersegmental furrow, in *c* setal lines. *Female pores*: A pair of small pores on 14, below *c* setal lines. *Male pores*: Externally could not be traced; presumably in 17/18 intersegmental furrow, as spermathecal ducts run up to 17 where they enter body wall. *Spermathecal pores*: In 11/12 and 12/13 intersegmental furrows; 3 at each side.

Clitellar region (Fig. 25): *Clitellum* (Fig. 26): Saddle-shaped, segmented, yellowish-grey on mature specimens, brown on immatures; on 13–23. *Tubercula pubertatis*: On 17–20; oblong, with wing-shaped protruding lobes; together with ventro-lateral parts of genital fields resemble oblong pockets. *Genital fields*: Trapezoid-shaped, divided by intersegmental furrows, rimmed; on 17–19, 20. *Papillae*: Paired on 13, 14, 15, in *ab* setal lines; on holotype a single papilla at left side of 21.



Figs 25–26. *Proandricus thornvillensis* sp. n. 25. Clitellar region, ventral. 26. Clitellum, dorso-laterally.

Internal characters

Septa: 4/5–6/7 very thin, strong; 7/8 and 8/9 very much thickened, muscular. *Gizzard*: In 7, globular, muscular. *Calciferous glands*: In 9; a pair closely adherent to oesophagus; very narrow grooves separate glands dorsally and ventrally. *Intestine*: Commences in 13. *Dorsal blood vessel*: doubled in 5–9; in 5–6 doubled, separated; in 7 partly doubled, close; 8 doubled, separated; 9 cordiform; crossing septa and as from 10 single. *Paired dorso-ventral commissural vessels*: in 5–11; 5–7 thin; 8–11 thickened moniliform hearts. *Nephridia*: Meganephridia, with thin coiled loops and open V-shaped caeca; nephrostome lateral.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement; in 10, one pair enclosed into one testis sac, corresponding with vesiculae seminales. *Vasa deferentia*: Single ducts, thin, running up to 17 where they enter body wall. *Seminal vesicles*: One pair in 11, connected to testis sac. *Spermathecae*: Small, oblong, coiled ampullae; close to septa 11/12 and 12/13; 3 at each side. *Genital glands*: Two finger-shaped, thick glands, corresponding with papillae; paired in 13, 14, 15; single at left side in 21. There is a small degree of variation of individual glands within population: size and shape may differ slightly, and in a case of larger glands they go through septa into neighbouring segments.

Discussion: *P. thornvillensis* is related to *gracilis* and probably to *jasoni*. Differs however in the shape of highly characteristic, wing-shaped tubercula pubertatis.

Tritogenia Kinberg, 1867

Type genus: *Tritogenia sulcata* Kinberg, 1867.

Preclitellar segments with secondary, external annulation. Setae minute, closely paired. Male pores intraclitellar. Spermathecal pores in front of male pores. One oesophageal gizzard in area of 6–7. Calciferous glands with or without stalk, in 9–10. Nephridia small, more than one pair per segment, placed anteriorly or posteriorly in each segment. Holandric or proandric, with enclosed spermiductal funnels.

Terrestrial

Thirteen species (2 uncertain). Presently known only from South Africa, with majority of species recorded from Natal, one known from Orange Free State, two from Transvaal. Supposition however exists that more species may be found in South Africa, and even in southern Zimbabwe and Mozambique.

Key to the species of *Tritogenia* Kinberg, 1867

1 Testes and spermiductal funnels in proandric arrangement 2
– Testes and spermiductal funnels in holandric arrangement 3

2 Clitellum on 15–25, 26; tubercula pubertatis on 18–23, 24 .....
melmothana (Michaelsen, 1928)
– Clitellum on 14–28; tubercula pubertatis on 1/*n* 16, 16–22 .....
zululensis (Beddard, 1907)

3 Oesophageal gizzard in 7 4
– Oesophageal gizzard in 6–7 5

4 Spermathecal pores in two intersegmental furrows (11/12, 12/13) ..... **karkloofia** Plisko & Zicsi, 1991
– Spermathecal pores in six intersegmental furrows (11/12–16/17) ..... **crassa** Michaelsen, 1918

5 Distance between *aa* setal lines diminishing at clitellar region; tubercula pubertatis on 17, 18–20, 21 ..... **sulcata** Kinberg, 1867
– Not so 6

6 Spermathecal pores absent or in only one intersegmental furrow 7
– Spermathecal pores in more than one intersegmental furrow 9

7 Spermathecal pores in 12/13 ? (uncertain position); tubercula pubertatis on 15–20 ? ..... (uncertain species) **benhami** (Michaelsen, 1900)
– Spermathecal pores absent or in 12/13; clitellum on 13, 14–25; tubercula pubertatis on 19–21 ..... **grisea** (Michaelsen, 1902)
– Spermathecal pores in 12/13 8

8 Dorsal blood vessel doubled in 4–11; clitellum on 13–25, 26; tubercula pubertatis on 19–1/2 21, 21 ..... **kruegeri** Plisko & Zicsi, 1991
– Dorsal blood vessel doubled in 5–11; clitellum on 13–22; tubercula pubertatis on 19–21 ..... **ngomensis** sp. n.

9 Spermathecal pores in two intersegmental furrows: 11/12 and 12/13 10
– Spermathecal pores in three intersegmental furrows 10/11, 11/12 and 12/13; clitellum on 13–22; tubercula pubertatis on 18–22 ..... **mucosa** Plisko & Zicsi, 1991

10 Dorsal blood vessel doubled only in three segments (9–11); clitellum on 13, 14–22; tubercula pubertatis on 18, 19–21, 22 ..... **howickiana** (Michaelsen, 1913)
– Dorsal blood vessel doubled in more than three segments 11

11 Dorsal blood vessel doubled in 4–10. Clitellum on 14–27, 28; tubercula pubertatis on 1/*n* 17–22 ..... **shawi** Plisko & Zicsi, 1991
– Dorsal blood vessel doubled in 4–11. Clitellum on 14–22. Tubercula pubertatis on 1/2 18–21 ..... **curta** Plisko & Zicsi, 1991

Tritogenia benhami (Michaelsen, 1900)

Brachydrilus [sp.] Benham, 1888: 72.
Brachydrilus benhami Michaelsen, 1900: 462; Reynolds & Cook, 1976: 77.
Tritogenia benhami; Michaelsen, 1918: 337; Reynolds & Cook, 1976: 77; Plisko & Zicsi, 1991: 111.

Known only from the type material, a specimen classified by Benham as '*Brachydrilus* sp. ?' from an unknown type locality. Described by Michaelsen (1900) with no data on the position of spermathaecae, clitellum or tubercula pubertatis. However, two pairs of nephridia per segment, and gizzard in segment 6, were noted. Michaelsen (1918) after considering the position of the gizzard and the nephridia, transferred the species to *Tritogenia*. No new material is available

and the type repository is unknown (Reynolds & Cook 1976). The taxonomic position of the species cannot be established.

Tritogenia crassa Michaelsen, 1918

Tritogenia crassa Michaelsen, 1918: 339; Reynolds & Cook, 1976: 91; Plisko & Zicsi, 1991: 117.

Described on one aclitellate specimen from Appelbosch [= Appelbos, 29°24'S:30°49'E] in Natal. All that remains of the type specimen, deposited in ZMUH under Inv. Nr. V 8501, is part of oesophagus and part of the calciferous glands (Plisko & Zisci 1991).

Known only from the type locality.

Tritogenia curta Plisko & Zicsi, 1991

Tritogenia curta Plisko Zicsi, 1991: 119. Type in LEUB.

Material examined: Natal: Vernon Crookes Nature Reserve [30°18'S:30°40'E] riverine bush in indigenous forest, dug out from dry, black soil, 6 June 1990, JDP & A. Zisci leg., 2 paratype specimens NMSA/Olig.00345; other material from type locality and its neighbourhood collected 22 November 1989: 1 clitellate – NMSA/ Olig.00749; 1 clitellate, 1 juvenile – NMSA/Olig. 00771; both JDP leg.

Known only from type locality or its neighbourhood.

Tritogenia howickiana (Michaelsen, 1913)

Microchaetus sulcatus var. *howickianus* Michaelsen, 1913*c*: 432; Reynolds & Cook, 1976: 115.
Tritogenia howickiana; Michaelsen, 1918: 333; Plisko & Zicsi, 1991: 112.

Described on two specimens collected from Howick [29°27'S:30°14'E]. Type material revised by Plisko & Zicsi (1991) with designation of lectotype deposited in ZMUH Inv. Nr. V 7658/a.

Material examined: Natal: Pietermaritzburg (29°36'S:30°24'E) greens between Longmarket and Church Streets, 5 March 1990, 8 clitellate, JDP leg., NMSA/ Olig.00363.

Known only from type locality and Pietermaritzburg.

Tritogenia karkloofia Plisko & Zicsi, 1991

Tritogenia karkloofia Plisko & Zicsi, 1991: 115.

Material examined: Natal: Karkloof Falls Nature Reserve, Safari World (29°25'S: 30°18'E) primary grassland, near water reservoir, at 20 cm depth, 4 January 1989, 1 holotype NMSA/Olig.00369, and 11 paratypes NMSA/Olig.00370 [not 303701 as recorded by Plisko & Zicsi 1991].

Known only from the type locality.

Tritogenia melmothana (Michaelsen, 1928)

Microchaetus melmothanus Michaelsen, 1928: 7; Reynolds & Cook, 1976: 135. Type allocated in ZMUH - 10434. Two paratypes in NMSA.
Tritogenia melmothanus, Reynolds & Cook, 1976: 135.

Described on three immature, poorly preserved specimens. Type locality broadly described as 'Zululand, Melmoth-Distrikt' [Melmoth = 28°32'S:31°25'E].

Material examined: Two paratypes specimens deposited in the Natal Museum Oligochaeta Collection, bearing identification labels in Michaelsen's handwriting, data on collection, corresponding to those given in original description (type No 451 old accession number 1171), and NMSA/Olig.00260.

Due to bad preservation, decomposition and abscission of inner part of 9–30 segments, examination of internal characters is difficult. External characters however are in accord with Michaelsen's description. Nephridia were not studied by Michaelsen. During my examination of postclitellar segments, two pairs per segment of small nephridia were found; it is not certain, however, if they are separated or united.

Michaelsen's description of the gizzard in 6–7, and my discovery of two pairs of nephridia in postclitellar segments, enable me to allocate this species to *Tritogenia*.

Known only from the type locality.

Tritogenia morosa Cognetti, 1906

Tritogenia morosa Cognetti, 1906: 13; Michaelsen, 1908: 31; 1918: 338; Reynolds & Cook, 1976: 141; Plisko & Zicsi, 1991: 112.Type NHMW. (Not seen by myself).
Tritogenia sulcata [part.]; Michaelsen, 1908: 31.
Microchaetus sulcatus f. *typicus* [part.] Michaelsen, 1913*c*: 431.
Microchaetus morosa; Reynolds & Cook, 1976: 141.

Described on a single specimen from Durban [29°53'S:31°00'E]. Michaelsen (1908 1913*c*) suspected that some specimens previously identified as *sulcata* should be allocated to *morosa*. On the basis of the description it is impossible at present to determine its relationships.

Tritogenia mucosa Plisko & Zicsi, 1991

Tritogenia mucosa Plisko & Zicsi, 1991: 113. Type and paratypes LEUB. Paratypes NMSA.

Material examined: Natal: 17 km NE of Pietermaritzburg, Ottos Bluff (29°29'S: 30°23'E): Crag Farm, primary grassland, dug from approximatelly 30 cm depth of hard but moist soil, 31 May 1990, 1 clitellate, JDP & A. Zisci leg., NMSA/Olig. 00347; Crag Farm, on the bank of local stream, 10 clitellate and 20 juveniles, 6 December 1989, JDP leg., NMSA/Olig.00315.

Known from several localities in the area of Pietermaritzburg.

Tritogenia ngomensis sp. n.

Figs 27–28

Etymology: Named after the type locality of Ngome Forest.

Material examined: Natal: Ngome Forest (27°52'S:31°24'E); indigenous forest, bordering the rand of the road, from litter and top layer of moist soil, 4 December 1990, 1 holotype and 2 juveniles paratypes, JDP & B. R. Stuckenberg leg. Holotype NMSA/Olig.00737; paratypes NMSA/Olig.00750.

External characters

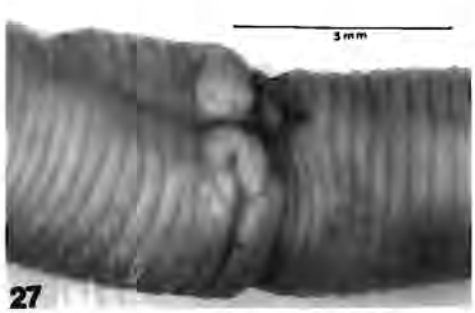
General: Body cylindrical, in life plump, soft. Preserved in alcohol (softened). *Colour*: In life whitish-grey. Alcohol preserved yellowish-light grey. *Dimensions*: Preserved and contracted: holotype 63 mm long, 5 mm wide at 10, 7 mm at tubercula pubertatis; paratypes: 35–46 mm long. *Segments number*: Holotype 81; paratypes 63–83. *Prostomium*: Prolobous, small. *Segmentation*: 1–3 simple with irregular grooves; 4–9 with two simple ringlets, equal size and similar appearance; 10 and the following segments simple. *Setae*: Minute, closely paired. *Nephridial pores*: Not noticeable. *Female pores*: Not noticeable. *Male pores*: Externally could not be traced; presumably on 19 or in 18/19 intersegmental furrow as spermathecal ducts run into 18 where entering body wall. *Spermathecal pores*: Not traced.

Clitellar region (Fig. 27): *Clitellum*: Saddle-shaped, segmented but not clearly bordered, terminated at *cd* setal lines; yellowish-white; on 13–22. *Tubercula pubertatis* (Fig. 28): On 19–21, separated from clitellum by narrow grooves.

Internal characters

Septa: 4/5–8/9 very much thickened, strong; 9/10 and 10/11 very thin, delicate. *Gizzard*: In 6–7, globular. *Calciferous glands*: In 9–10. *Intestine*: Commences in 14. *Dorsal blood vessel*: doubled in 5–11; thin, close, but not fussed in 5–8; 9–11 much enlarged separated tubes; doubled when crossing septa. *Paired dorso-ventral commissural vessels*: in 5–11; 5–8 thin; 9–11 thickened moniliform 'hearts'. *Nephridia*: Small nephridia; 2 pairs per segment. *Spermathecae*: 8 at each side in form of small, oblong, coiled ampullae, in only one segment, close to septa 12/13.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement, in 10 and



Figs 27–28. *Tritogenia ngomensis* sp. n. 27. Clitellar region, ventral. 28. Tubercula pubertatis.

11; 2 pairs, very small and difficult to trace. Two spermiducts, thin, serpentine, extend up to 18 where they enter body wall. *Seminal vesicles*: One large pair in 11, pushing septa into 12. *Genital glands*: One pair of small, oval glands in 10, 11 and 14; two pairs in *ab* and *cd* setal lines of similar, oval, flat glands, corresponding to setae.

Discussion: *T. ngomensis* resembles *sulcata* Kinberg, 1867. Differs in position of clitellum and arrangement of setae.

Tritogenia shawi Plisko & Zicsi, 1991

Fig. 29

Tritogenia shawi Plisko & Zicsi, 1991: 117. Holotype NMSA/Olig.00364.

Described on a single specimen collected from Pietermaritzburg (29°36'S: 30°24'E) Cleland, Lynroy Avenue, from garden soil.

Material examined: Natal: Pietermaritzburg (29°36'S:30°24'E): Darvill, grassland, from moist soil of dry bed of local stream, 1 mature, 11 October 1990, NMSA/Olig.00659 and from wet soil on bank of stream, 30 January 1991, 1 juvenile, NMSA/Olig.00800; Scottsville Golf Course, from top layer of watered grass, 3 semi-mature, 10 November 1989, NMSA/Olig.00473.

Noted only from Pietermaritzburg area.

External characters

General: Body cylindrical; in life, when contracted, firm and muscular; relaxed, soft and plump. Alcohol preserved, medium firm. *Dimensions*: In life, not stretched 120–130 mm long and 14–17 mm wide; preserved 124–136 mm long; anteriorly 13–14 mm wide, and 16–17 mm in clitellar region. *Segments number*: 103–130. *Prostomium*: Prolobous, not clearly distinguished from first segment, with short, longitudinal grooves. *Segmentation*: 1–3 simple, with many short, irregular, longitudinal grooves; first segment not distinguished from second; 4–6 with two annuli, equal size and similar appearance, slightly annulated with incomplete, transverse lines; 7–9 each with two ringlets, first somewhat larger than second; clitellar and postclitellar segments simple, with randomly placed shallow, transverse grooves, gradually diminishing in size. Some abnormality in segmentation and annulation was observed: due probably to the regeneration of previously injured lateral part of the body, specimen from Scottsville has not completed triangular, additional segments in region of 9–13. *Setae*: Minute, very closely paired; first pairs of *ab* on first ringlet of 5. *Nephridial pores*: Not noticeable. *Female pores*: Minute, on 14, between *bc* setal lines. *Male pores*: Paired, on segment 19, above *b* setal lines, in one of the irregular groove of tubercula pubertatis. *Spermathecal pores*: In intersegmental furrows 10/11 and 11/12.

Clitellar region (Fig. 29): *Clitellum*: Not clearly demarcated, saddle-shaped, segmented, on segments 14–27, (?) 28. *Tubercula pubertatis*: Glandular, nearly square swellings, with irregular intersegmental furrows and some additional

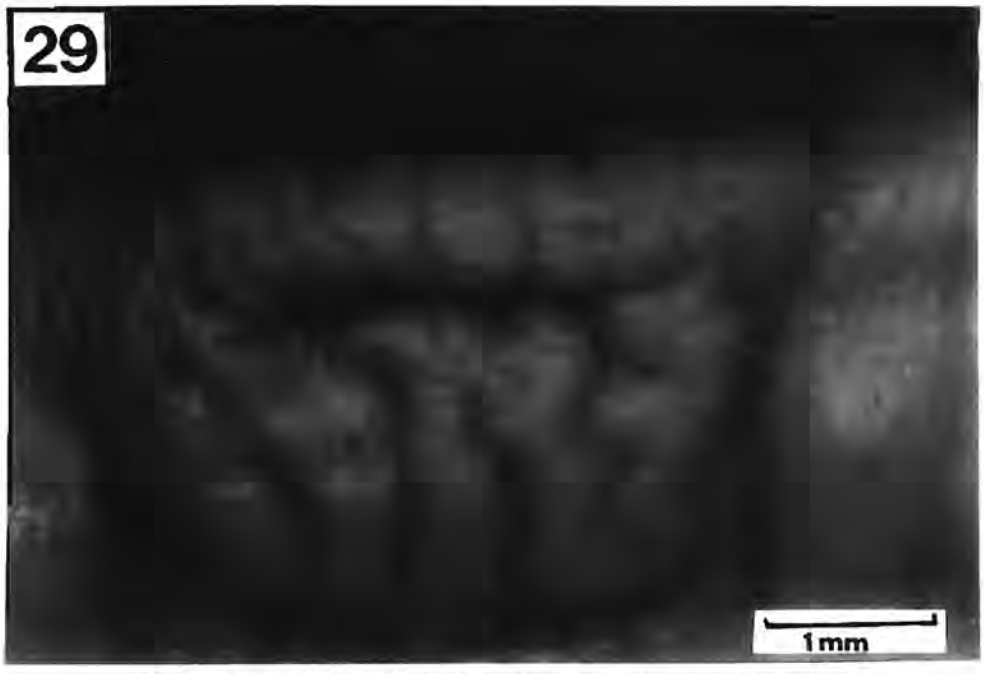


Fig. 29. *Tritogenia shawi* (Plisko & Zicsi, 1991). Tuberculum pubertatis, ventral.

grooves; on segments 18–22; begin at the lateral clitellar line and extend below *a* setal lines. *Papillae*: A pair of globular glands, on 15 and 24, extending into neighbouring segments, in *ab* setal lines.

Internal characters

Septa: 4/5 moderately thickened, but strong; 5/6, 6/7, 7/8, 8/9 very much thickened, muscular; internal part of 6/7 dorsally fixed into middle zone of gizzard; 9/10–11/12 very thin, delicate. *Gizzard*: Oblong, muscular, in segments 6–7. *Calciferous glands*: One pair of globular, muscular glands in segment 9; closely adherent to oesophagus; externally equipped with blood vessels. *Intestine*: Commences in segment 13. *Dorsal blood vessel*: Doubled in 4–10: separated in 5–8; 9 doubled, close thick tubes; 10 cordiform; 11 thickened, single; doubled at crossing septa. *Paired dorso-ventral commissural vessels*: Thin tubes in 4–7; 9–11 thicker, moniliform 'hearts'. *Nephridia*: In preclitellar segments two pairs of thin, looped, small nephridia. In some postclitellar segments sometimes more than two pairs.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement; in segments 10 and 11; two pairs enclosed in seminal chambers. *Seminal vesicles*: Two pairs, small, oblong, folded sacs; in 10 and 11. *Spermathecae*: Small, variable shape, with short ducts covered by body wall; 2–7 ampullae at each side of segment in 12 and 13; lower number of ampullae in 12; in 13 usually 4–7.

Genital glands: Flat, glandular, corresponding to papillae; in 14, 15 and 23; containing sexual setae.

Biological notes: *T. shawi* is the largest of all known species in the genus. Recorded from the Pietermaritzburg area in grassland, river beds, gardens and lawns (all formerly primary grassland). Associated with *M. papillatus*, one of the larger *Microchaetus* species; in life, both species are brownish-grey with greenish tint.

Tritogenia sulcata Kinberg, 1867

Tritogenia sulcata Kinberg, 1867: 97; Perrier, 1886: 876; Michaelsen, 1899*b*: 415; 1900: 453; 1918: 338; Reynolds & Cook, 1976: 176. Type NHRS (not seen).
Megachaeta (*Tritogenia*) *sulcata*; Michaelsen, 1891: 50.
Megachaeta? sulcata; Michaelsen, 1891: 50.
Tritogenia sulcata [part.]; Michaelsen, 1908: 31.
Microchaetus sulcatus f. *typicus* Michaelsen, 1913*c*: 431.
Tritogenia morosa Cognetti, 1906; Michaelsen, 1913*c*: 431; 1918: 338.
Microchaetus sulcatus; Reynolds & Cook, 1976: 176.
Megachaeta sulcata; Reynolds & Cook, 1976: 176.

Known only from type material collected from Port Natal [= Durban 29°53'S:31°00'E]. Original description inadequate. Revised by Michaelsen (1899*b*). Characteristics given for *morosa* by Cognetti (1906) and Michaelsen (1918) suggests that *morosa* may be a synonym of *sulcata*.

Tritogenia zululensis (Beddard, 1907) **comb. n.**

Fig. 30

Microchaetus zululensis Beddard, 1907: 297; Michaelsen, 1913*c*: 436; 1918: 331; 1928: 6. Type depositary unknown (Reynolds & Cook, 1976: 192; Coles 1981: 299).
Microchaeta zululensis; Coles, 1981: 299.
Microchaetus zululensis [erroneous] Michaelsen, 1907: 279; Reynolds & Cook, 1976: 192.
Microchaetus zulu Michaelsen, 1907: 6. Type depositary unknown.
Microchaetus zulu Michaelsen, cf. [erroneous] *M. zululensis* Michaelsen, 1907; Reynolds & Cook, 1976: 192.

Recorded only from the type locality and vicinity.

From the citation in the 'Catalog' of Reynolds & Cook (1976) it may be inferred that both the names *zulu* and *zululensis* are to be credited to Michaelsen. This information, however, is incorrect. Two species, both from Zululand, were described almost simultaneously by Beddard and Michaelsen, with Beddard's having priority. Michaelsen (1913*c*) accepted his *zulu* as a synonym.

The species was described on two fragments of two mature specimens from northern Natal (Zululand), with no specified locality. Michaelsen (1913*c*) redescribed the type material, together with the material for his *zulu*, and a new collection from Zululand, supplied by E. Warren, with several mature specimens from Mfongosi, collected in September 1911 by W. E. Jones. New material examined by me is from the same locality as Michaelsen's specimens collected by W. E. Jones, but collected two years later (1913).

Material examined: Natal: Zululand, Mfongosi [28°42'S:30°48'E], 19 March 1913, 6 clitellate, 9 juveniles, W. E. Jones leg., NMSA/Olig.00349.

External characters

General: Michaelsen (1913*c*) described body in life: clumsy, thick, short. Examined by myself, preserved specimens are thick, hard with much contracted segments; postclitellar part slightly softened. *Colour*: Beddard and Michaelsen described material in life as greyish with greenish tint dorsally and yellowish-grey ventrally. Examined preserved specimens are reddish-brown. *Dimensions*: Preserved and contracted 72–145 mm long (Michaelsen gives 90–145 mm long) 9–11 mm wide at 10, 19 mm at tubercula pubertatis. *Segments number*: 102–135. *Prostomium*: Prolobous, not clearly distinct from first segment, with longitudinal grooves. *Segmentation*: 1–3 simple, 4–10 with two simple ringlets; the following simple. *Setae*: Minute, first pairs of *ab* on first ringlet of 4, first pair of *cd* on 10. *Female pores*: In 14/15 intersegmental furrow between *ab cd* setal lines; this characteristic is in accordance with Michaelsen's description. *Male pores*: Could not be found. Both Beddard and Michaelsen did not find pores, though supposed that they may be present in 14/15 intersegmental furrow. *Spermathecal pores*: Difficult to trace. Michaelsen (1913*c*) redescribing type material wrote: '. . . in the specimen on which I have founded my *M. zulu* the spermathecal pores formed groups of 1–10 at each side on the furrows between segments 11/12 or 12/13 to 15/16 . . . . In one or two recently examined mature specimens I could not see spermathecae [and spermathecal pores], just as Beddard failed to find them. . .' In presently examined material I have found small spermathecal pores, 2–5 at each side, in 13/14, 14/15, 15/16, 16/17, 17/18 intersegmental furrows.

Clitellar region (Fig. 30): *Clitellum*: Saddle-shaped, in some specimens not

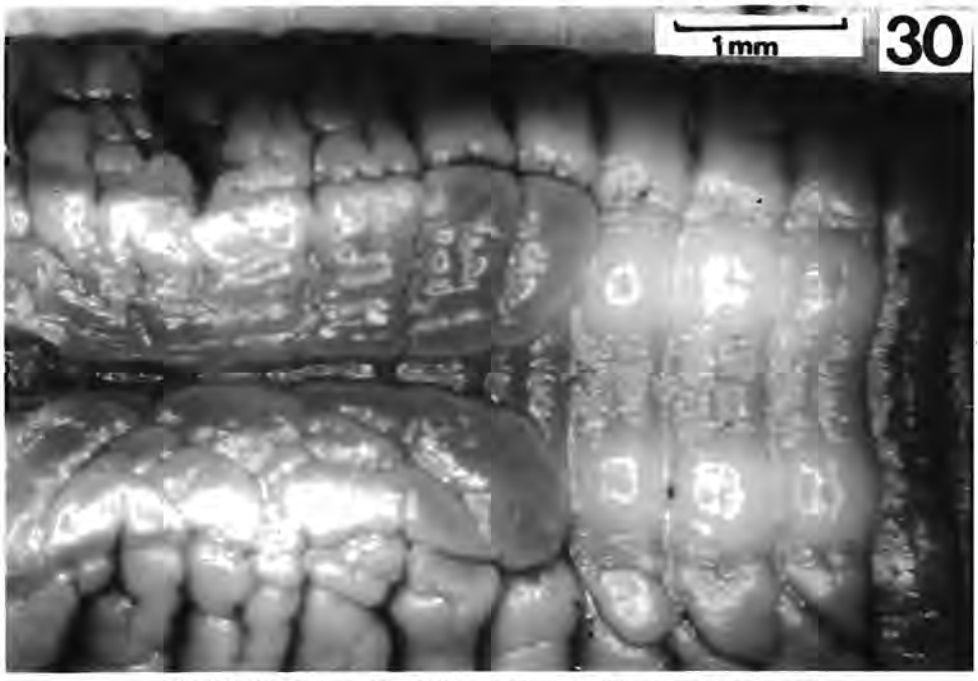


Fig. 30. *Tritogenia zululensis* (Beddard, 1907). Clitellar region, ventral.

distinctly bordered, on 14–28. *Tubercula pubertatis*: Broad glandular ridges between ventral line of clitellum and slightly below *a* setal lines; on 1/*n* 16–22. Michaelsen (1907) for synonymic species *M. zulu* stated position of tubercula pubertatis '17–22'. On one not fully mature specimen, tubercula agree with this description. *Papillae*: Glandular swellings with minute nipples, consisting sexual setae; on 11, 12, 13, 23–26, 27; these allocated in front of clitellum usually considerably larger than those of clitellum area. There is some individual variations in the shape and number of papillae: a single papilla can occur replacing those paired, but, a six pairs of them always can be found. My observation on these character is in accord with Beddard's (1907) and Michaelsen's (1907 1913*c*) descriptions.

Internal characters

Septa: 4/5 moderately thickened, 5/6, 6/7, 7/8 and 8/9 very much thickened, other septa thin, delicate. *Gizzard*: In 6–7 with septa 6/7 adherent in its first quarter, not in the middle as indicated by Michaelsen (1907). *Calciferous glands*: Small glands, in 9. *Intestine*: Commences in 12. *Dorsal blood vessel*: Doubled in 5–8; in 9 and 10 cordiform organ. *Paired dorso ventral commissural vessels*: 5–8 thin, 9–11 enlarged, moniliform tubes. *Nephridia*: Small nephridia, 7 pairs placed on one oblong tube in clitellar and postclitellar segments.

Reproductive organs: *Spermiductal funnels*: Proandric arrangement; one pair enclosed in testis sac, in 10. *Spermathecae*: Tiny ampullae embedded in body tissue close to septa 13/14, 14/15, 15/16, 16/17, 17/18; 2–5 ampullae at each side, with not equal numbers per side. Beddard (1907) and Michaelsen (1907 1913*c*) did not see spermathecae probably as the tiny ampullae are deeply embedded in body tissue. *Seminal vesicles*: One pair of two-folded, thick, sacs in 11, projecting into 12. *Genital glands*: In 12, 13, 23–26; hemispherical, indistinctly divided by narrow furrows, glandular; corresponding with external papillae. Consisting of sexual setae *ca.* 3 mm long.

DISCUSSION

Since the description of *Microchaetus* Rapp, 1849, the majority of recorded microchaetids have been placed in this genus, although two other genera, *Tritogenia* and *Geogenia*, described by Kinberg (1867), were available. As a result the genus has included species which are different anatomically: (i) species with one pair of large nephridia, and species with more than one pair of micronephridia; (ii) species in which the gizzard occupies segments 6–7, and species in which the gizzard is found only in segment 7; (iii) species with either proandric or holandric arrangement; (iv) species with variably shaped calciferous glands.

This broad definition of *Microchaetus* has been accepted by the majority of authors (Benham 1886*a b*, Beddard 1895, Michaelsen 1900, Stephenson 1930, Brinkhurst Jamieson 1971), as natural groups were not obvious. Michaelsen 1918, Pickford 1975, and Plisko 1991*b*, however, suspected that *Microchaetus* may be made up of several distinct lineages.

An attempt to separate some of the species from the composite *Microchaetus* was

undertaken by Ljungström in unpublished notes (see Brinkhurst & Jamieson 1971, Pickford 1975). Ljungström suggested that the shape of the calciferous glands may be an adequate character for the resurrection of *Geogenia*, previously united with *Microchaetus* by Michaelsen (1918). However, this character does not provide an adequate base for natural classification. The structure of calciferous glands is strikingly similar within the whole genus *Microchaetus s. l.* The vestigial division, even when the gland appears to be externally single, reflects in its internal structure a paired origin (Pickford 1975). Although the calciferous glands are characteristic of the whole family Microchaetidae (Michaelsen 1918), and are used for the separation of species, in my opinion they cannot as yet be considered for generic characterisation.

A natural division of the composite *Microchaetus* has here been achieved using characters of the male genitalia. I have used the primitive holandric arrangement to unify a number of species within *Microchaetus s. l.* while the proandric arrangement serves to group others in what is here described as a new genus *Proandricus*.

Together with the three new species described in this paper, seven species of *Microchaetus s. str.* are known from Natal, and sixteen from Cape Province; in *Proandricus* five new species are described, giving altogether nine from Natal, seven from the other provinces of South Africa, and one from Lesotho.

Generic distinction on the basis of nephridial condition has served to separate *Tritogenia* from other microchaetids. In this paper both *T. melmothana* (Michaelsen, 1928) and *T. zululensis* (Beddard, 1907), originally described in *Microchaetus* (characterised by the possession of a single pair of large segmental nephridia), have been transferred to *Tritogenia* (characterised by the possession of more than one pair of small nephridia). Paratype specimens of *melmothana* have two pairs of small nephridia per segment. For the study of *zululensis*, specimens collected from the same locality as those described by Michaelsen (1907) under the synonym *M. zulu,* as well as the material studied for Michaelsen's (1913*c*) subsequent review, were used. In *zululensis* seven pairs of very small nephridia, positioned on one oblong tube, were found in postclitellar segments.

It is not possible at present, without types being studied or new material collected, to determine the generic position of some species previously assigned to *Brachydrilus*, *Geogenia* or *Tritogenia* (Benham 1888, Kinberg 1867, Cognetti de Martiis 1906, Michaelsen 1900 1913*c*). Some of these species were described on single, immature, badly preserved specimens, or else nephridia were unstudied. Although such species are included in the list of *Tritogenia*, their systematic position must remain uncertain. With the description of *ngomensis* sp. n. there are now eleven species (including those uncertain) of *Tritogenia* known from Natal, as well as two from the Transvaal.

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